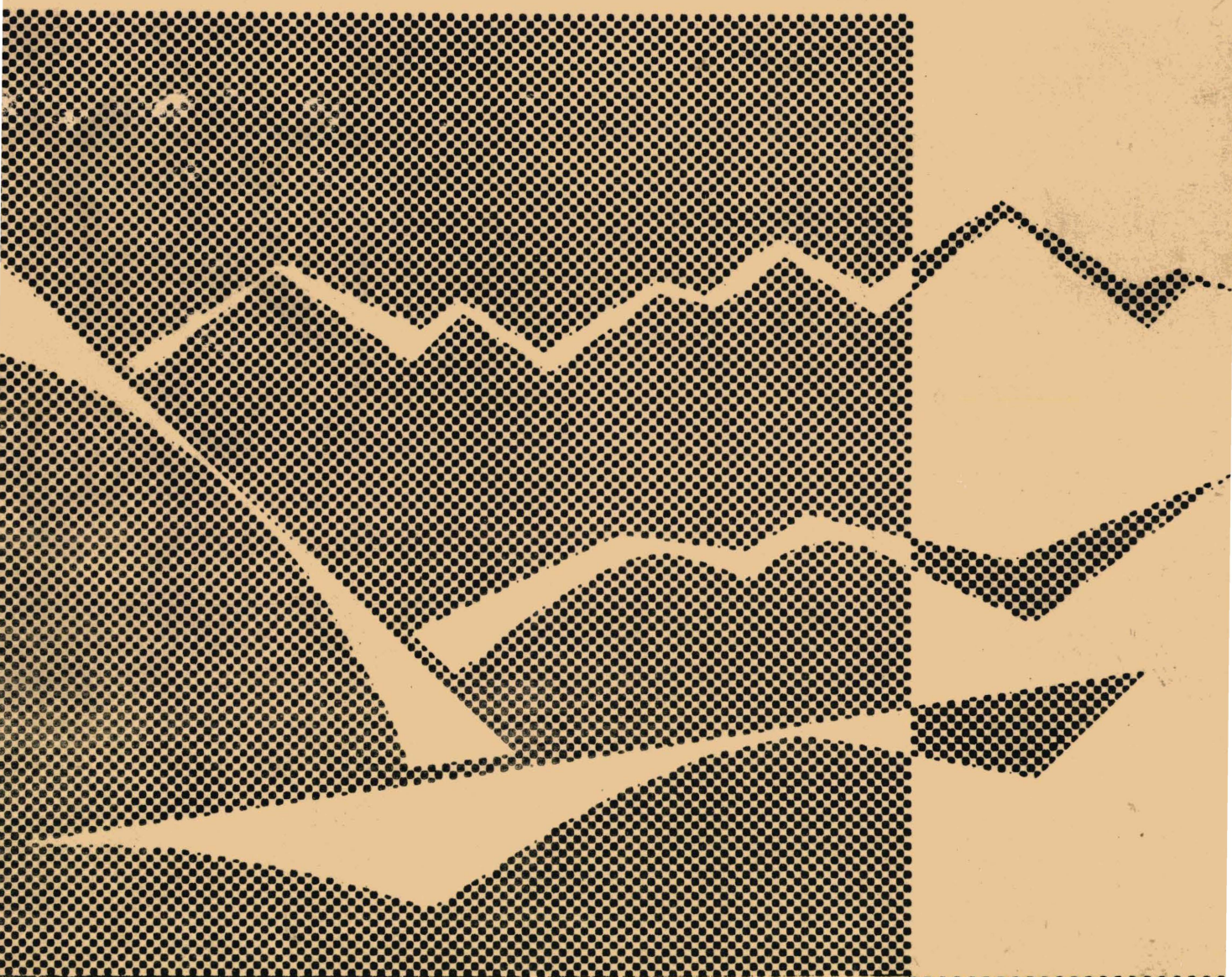
Thesis/
Reports
Schlatterer,
E.F.

MARCH 1972

a preliminary description of *PLANT COMMUNITIES* found on the SAWTOOTH WHITE CLOUD, BOULDER AND PIONEER MOUNTAINS

Edward F. Schlatterer



U. S. DEPT AGRICULTURE · FOREST SERVICE · INTERMOUNTAIN REGION

A PRELIMINARY DESCRIPTION OF THE PLANT COMMUNITIES FOUND ON THE SAWTOOTH, WHITE CLOUD, BOULDER AND PIONEER MOUNTAINS

Region 4

U. S. Forest Service

1972

Edward F. Schlatterer

A Preliminary Description of

PLANT COMMUNITIES

Found on the Sawtooth, White Cloud, Boulder, and Pioneer Mountains

by

Dr. Edward F. Schlatterer
Ecologist
Division of Range Management

U. S. Forest Service - Intermountain Region

March 1972

TABLE OF CONTENTS

INTRODUCTION 1

DESCRIPTION OF PLANT COMMUNITIES 2

I. Ponderosa pine 3

Ponderosa pine/bluebunch wheatgrass 3

II. Douglas fir 5

Douglas fir/pinegrass 5
Douglas fir/snowberry 9
Douglas fir/elk sedge-snowberry 12
Douglas fir/tall shrubs 14

III. Subalpine fir-Engelmann spruce 16

Subalpine fir/grouse whortleberry 16
Subalpine fir/elk sedge 19
Subalpine fir/snowberry 22
Subalpine fir-engelmann spruce/western ledum 24
Engelmann spruce-subalpine fir/bluejoint reedgrass 26
Engelmann spruce-subalpine fir/tall forb 28

IV. Lodgepole pine 29

Lodgepole pine/Idaho fescue 29

V. Whitebark pine 31

Whitebark pine/barren 31

VI. Aspen 33

Aspen-snowberry-elk sedge 33

VII. Curlleaf mountain mahogany 36

Curlleaf mountain mahogany/bluebunch wheatgrass 36

VIII. Low sagebrush 39

Thermopola low sagebrush/Idaho fescue 39
Low sagebrush/bluebunch wheatgrass 41
Low sagebrush/Idaho fescue 43

IX. Threetip sagebrush 45

Threetip sagebrush/Idaho fescue 45

X. Mountain silver sagebrush 47

Mountain silver sagebrush/Idaho fescue 47

XI. Basin big sagebrush 48

Basin big sagebrush/cheatgrass 48

XII. Wyoming big sagebrush 50

Wyoming big sagebrush/bluebunch wheatgrass 50

XIII. Mountain big sagebrush 52

Mountain big sagebrush/bluebunch wheatgrass 52
Mountain big sagebrush/Idaho fescue 55
Mountain big sagebrush/mountain brush 58

XIV. Subalpine big sagebrush 61

Subalpine big sagebrush/big mountain brome-Idaho fescue 61
Subalpine big sagebrush/Idaho fescue 63
Subalpine big sagebrush-mountain brush/elk sedge 65

XV. Grasslands 67

Bluebunch wheatgrass/oniongrass 67
Alpine fescue 69

XVI. Alpine types 70

Cushion plant-*Arenaria aculeata* 70
Cushion plant-*Ivesia gordonii* 72
Alpine dryland types-Drummond rush-Tolmie sedge 74
Rocky slope-boulder field 75
Sibbaldia/*Cassiope* 76

XVII. Meadow communities 77

A. Low to mid-elevation 77

Beaked sedge 77
Willow/water sedge 77
Tufted hairgrass 78
Mid-elevation meadow complex 78

B. High elevation 79

Black alpine sedge/alpine bentgrass 79
Red mountain heath/western ledum 79
Alpine willow 80

KEY TO THE PLANT COMMUNITIES 81

KEY TO THE SPECIES, SUBSPECIES, AND FORMS OF SAGEBRUSH 92

LITERATURE CITED 95

PARTIAL PLANT LIST 98

INTRODUCTION

During the field seasons of 1970 and 1971, a tentative classification of the vegetation types on the Sawtooth, White Cloud, Boulder and Pioneer Mountains was developed. Most of the field time was spent on the White Cloud, Boulder and Pioneer mountain portions of the area during this period. Heavy reliance was placed on information previously collected by Lewis and Riegelhuth (1964) for vegetation data on the Sawtooth Mountain part of the area.

Where possible, the classification was modeled using the habitat type concept as developed by Daubenmire (1952). He defined a habitat type as ". . . the collective area which one association occupies, or will come to occupy as succession advances."

Because few undisturbed areas could be found, only tentative habitat types could be described for those vegetation associations that appeared to be stable and exhibit conditions of near maximum development under the prevailing environmental conditions.

An attempt was made to relate the vegetation communities found, to habitat types previously described by other workers in similar situations in the Intermountain Region, particularly those of Daubenmire and Daubenmire (1968), Daubenmire (1970), Reed (1969), and Lewis and Reigelhuth (1964). Many of the communities described did not fit well into previous classifications and new types were tentatively described. Particularly in the nontimbered vegetation, the degree of disturbance was often so great due to grazing and other factors, that the community that would be encountered under stable conditions could not be ascertained. Vegetation studied under such conditions was described as community types that indicate the present status rather than its potential condition.

It must be emphasized that all the vegetation types described are tentative and will require further verification. Vegetative types that were also described by authors on other areas are probably relatively permanent and can be considered as habitat types. All other types are considered to be community types that represent current condition rather than potential condition.

Plant nomenclature follows Holmgren and Reveal (1966) for the most part, but Hitchcock et al (1955) (1959) (1961) (1964) (1969), Hitchcock (1950) and Davis (1952) were used liberally particularly for species not listed by the first authors. Nomenclature for Carices follows Hermann (1970) with a few minor exceptions. Common names were taken primarily from Kelsey and Dayton (1942) and Holmgren and Reveal (1966). Subspecies and form names for big and low sagebrush were taken from Beetle (1960), Beetle and Young (1964) and Winward (1970).

DESCRIPTION OF PLANT COMMUNITIES

I. Ponderosa pine

Ponderosa pine/bluebunch wheatgrass (*Pinus ponderosa*/*Agropyron spicatum*)

A. Geology and land types:

Ponderosa pine is restricted to the westernmost part of the area and is found exclusively on granitic soils. It is associated with the Valley Train land type in the Sawtooth Moraine land group, the Granitic Glaciated lands and the Granitic Mountain lands.

B. Elevation and aspect:

All sites examined were below 6,000 feet and on southerly aspects.

C. Species composition:

Species found include:

Pinus ponderosa - Ponderosa pine
Agropyron spicatum - Bluebunch wheatgrass
Festuca idahoensis - Idaho fescue
Bromus tectorum - Cheatgrass
Balsamorhiza sagittata - Balsamroot
Crepis acuminata - Tapertip hawksbeard
Hieracium albertinum - Hawkweed
Gayophytum ramosissimum - Groundsmoke
Phacelia hastata - Scorpion weed
Potentilla glandulosa - Gland cinquefoil
Cirsium foliosium - Elk thistle
Linaria vulgaris - Butter-and-eggs toadflax
Machaeranthera canescens - Hoary aster
Berberis repens - Creeping barberry
Ceanothus velutinus - Snowbush ceanothus
Artemisia tridentata ssp. *vaseyana* - Mountain big sagebrush
Sambucus racemosa - Elderberry
Prunus virginiana - Chokecherry
Purshia tridentata - Bitterbrush
Rosa spp. - Rose

D. Productivity:

Understory production varied from 400 pounds to 1,200 pounds per acre. Potential for timber production is low due to low natural stocking of this type.

E. Seral conditions:

Unknown.

F. Disease and insect problems:

Two disease problems are important to ponderosa pine: Ponderosa pine dwarf mistletoe Arceuthobium campylopodum var. campylopodum, and Annosus root rot Fomes annosus.

Ponderosa pine dwarf mistletoe is particularly prevalent in lower productivity types such as Ponderosa pine/bluebunch wheatgrass and its influence has been fostered by select logging that removes the best trees and leaves the rest. A second important factor is the suppression of all natural fires in these stands. Fire has been an effective natural controlling agent in limiting dwarf mistletoe.

The incidence of Annosus root rot is favored by any operation which creates stumps.

Both the pine butterfly (Neophasia menapia) and the mountain pine beetle are known to occur in the area. Their impact on ponderosa pine in the study area is thought to be low.

G. Key indicators:

The presence of a dominant ponderosa pine overstory with a bunchgrass understory composed primarily of bluebunch wheatgrass is the prime indicator of the type. Too few sites were examined to make a finer separation. It is suspected, however, that sites with more dominant Idaho fescue in the understory could be separated into a separate type as was done by Daubenmire and Daubenmire (1968).

It is also necessary to separate seral stands of ponderosa pine occurring on Douglas fir/pinegrass sites.

H. Others who have described similar types:

Daubenmire and Daubenmire (1968).

II. Douglas fir

Douglas fir/pinegrass (*Pseudotsuga menziesii*/*Calamagrostis rubescens*)

A. Geology and land types:

Phase 1 - Granitic Soils

This phase of the Douglas fir/pinegrass type is characteristic of relatively well developed soils derived from granitic parent material. The type occurs extensively on the Sawtooth Batholith in the northwestern part of the area. It is found on Granitic Mountain lands, the Granitic Glaciated lands with well developed soils, and Terrace and Dry Alluvial land types in the Depositional land and Sawtooth Moraine land groups.

Phase 2 - Sedimentary Soils

This phase of the Douglas fir/pinegrass type occurs on well developed soils derived from Wood River Sedimentary material. The type occurs in the southwestern part of the area.

Occasional pockets of the type occur on Challis Volcanic soils, but it is never very extensive on this geologic material and is limited to seeps with subsurface moisture available.

This type is found primarily on Wood River Mountain lands, but occurs only occasionally on Glaciated land groups as well.

B. Elevation and aspect:

The elevational range is from below 6,000 feet to approximately 7,500 feet. The upper altitudinal range tends to be limited by the lack of well developed soils above 7,500 feet. Daubenmire and Daubenmire (1968) state that the Douglas fir/pinegrass type occurs at higher elevations than any other Douglas fir type in eastern Washington and northern Idaho. In central Idaho there are few areas with well developed soils above 7,500 feet, and types such the Douglas fir/snowberry and the low productivity phases of the Douglas fir/elk sedge-snowberry are more common where Douglas fir occurs above 7,500 feet.

Both phases of the Douglas fir/pinegrass are common on northerly exposures and benches, but are occasionally found on southeasterly and southwesterly slopes as well, particularly in the northern and western part of the area.

C. Species composition:

In stable condition there are no other timber species associated with the Douglas fir in this type.

1. Understory species always present include:

   Calamagrostis rubescens - Pinegrass
   Carex geyeri - Elk sedge
   Poa nervosa - Wheeler bluegrass
   Calamagrostis rubescens almost always makes up more than half of the total understory production in this type.

2. Understory species usually present include:

   Arnica cordifolia - Heartleaf arnica
   Symphoricarpos oreophilus - Snowberry

3. Understory species that may be present include:

   Senecio cymbalarioides - Cleftleaf groundsel
   Carex rossii - Ross sedge
   Populus tremuloides - Trembling aspen
   Ribes cereum - Wax currant
   Pyrola secunda - Sidebells pyrola
   Frasera montana - Small frasera
   Epilobium angustifolium - Fireweed
   Shepherdia canadensis - Russet buffaloberry
   Vaccinium scoparium - Grouse whortleberry

D. Productivity:

This type is fairly productive for this Region, with a site index for Douglas fir that averages 85 (75-95).

Understory production is made up almost entirely by Calamagrostis rubescens and Carex geyeri and averages 400 to 500 pounds per acre.

E. Seral conditions:

Phase 1 - Granitic Soils

Following fire or timber removal with burning for brush disposal, this type does not appear to change very much in understory composition. Pinegrass remains dominant with a minor increase in shrubs and forbs. Lodgepole pine is the usual seral dominant following burning over much of the northern area. However, on the westernmost portion of the area in the Queens River drainage, stands of seral ponderosa pine were found to occupy the Douglas fir/pinegrass type. Aspen is only a secondary seral species on granitic soils.

Phase 2 - Sedimentary Soils:

The difference between seral conditions on Phase 1 on Granitic soils and Phase 2 on Sedimentary soils is that aspen tends to dominate seral stands on the latter, although lodgepole pine

may also be present. This difference may be more apparent than real, since the major zone of Granitic soils occurs in the cooler north and west portions of the area where aspen is not as abundant, but where lodgepole pine flourishes.

The major zone of Sedimentary soils occurs in the warmer southern part of the area where aspen types are naturally abundant.

Only small fragments of the Douglas fir/pinegrass type were found on Challis Volcanic soils, and these fragments occurred in pockets of relatively high moisture with well developed soils. Two few observations were made to make a judgment as to species present in seral stages.

F. Disease and insect problems:

Douglas fir dwarf mistletoe, Arceuthobium douglasii, is the main disease problem found in all Douglas fir types. Of the Douglas fir types found on the area, the intensity and impact of this disease seems to be minor on the Douglas fir/pinegrass type. It is postulated that the low intensity and impact is due to the relatively high growth rate and stocking rate that is characteristic of stands in this type. Relatively rapid height growth and lateral shading aid in reducing the rate of the disease spread. Many overmature Douglas fir trees were found to be heavily infected in this type, but it appeared that the disease did not become an important restriction on the trees' growth until it had reached a relatively old age.

Roe and Amman (1970) compared the incidence of dwarf mistletoe in seral lodgepole pine stands in three habitat types. They found that the incidence of this disease in the Douglas fir/pinegrass type was lower than in the Abies lasiocarpa/Pachistima myrsinites (Subalpine fir/mountain lover) and the Abies lasiocarpa/Vaccinium scoparium (Subalpine fir/grouse whortleberry) types. The incidence of mountain pine beetle was intermediate in the Douglas fir/pinegrass type.

Both the Douglas fir beetle (Dendroctonus pseudotsugae) and spruce budworm occur in Douglas fir in the study area. Their activity is relatively low at present with some problems occurring in localized areas.

G. Key indicators:

The open grasslike appearance of the understory with pinegrass as the major understory dominant is a good visual indicator of the type. Shrubs may be present, but they represent a minor component of the understory. This type may be confused with the Subalpine fir/bluejoint reedgrass type particularly when the overstory is in seral lodgepole pine. This latter type is more characteristic of streamside locals while the Douglas fir/pinegrass is characteristic of upland sites.

H. Others who have described similar types:

Daubenmire and Daubenmire (1968).

Douglas fir/snowberry - (*Pseudotsuga menziesii/Symphoricarpos oreophilus*

A. Geology and land types:

This type is characteristic of very rocky soils. It occurs most often on soils derived from Challis Volcanic geologic material, but is often found on Sedimentary and Granitic soils as well. The type also occurs on soils with low rock content in areas of low effective precipitation, particularly in the eastern and southern portions of the area.

Land groups on which this type is found include the Sawtooth Moraine land; Moraines in the Depositional land group with coarse rocky soils; rock structured Glaciated lands below 8,000 feet; the Mountain land groups; and in small pockets on the Hillslope lands.

B. Elevation and aspect:

The Douglas fir/snowberry type occurs from below 6,000 feet at the lowest point in the study area to approximately 8,000 feet in elevation. It may be found on all aspects depending on the locale, but is found most often on northerly facing slopes.

C. Species composition:

Lodgepole pine is the major seral species that invades this type following disturbance. Subalpine fir occasionally occurs in the cooler and wetter Douglas fir/snowberry stands, but normally Douglas fir is the only tree species found in the type.

1. Understory species always present include:

Symphoricarpos oreophilus - Snowberry
Senecio cymbalarioides - Cleftleaf groundsel
Arnica cordifolia - Heartleaf arnica

2. Understory species that are usually present include:

Ribes cereum - Wax currant
Carex geyeri - Elk sedge
Festuca idahoensis - Idaho fescue
Pyrola secunda - Sidebells pyrola

3. Understory species that may be present include:

Carex rossii (or *C. brevipes*) - Ross sedge
Juniperus communis - Common juniper
Sitanion hystrix - Squirreltail
Shepherdia canadensis - Russet buffaloberry

Crepis accuminata - Tapertip hawksbeard
Sedum stenopetalum - Wormleaf stonecrop
Poa nervosa - Wheeler bluegrass
Antennaria rosea - Rose pussytoes
Oryzopsis exigua - Little ricegrass
Lupinus argenteus - Silver lupine
Artemisia tridentata var. vaseyana - Mountain big sagebrush

D. Productivity:

This type is one of the least productive Douglas fir types. The site index for Douglas fir varies from 45 to 65 and usually averages 50-55.

The total production of all species including shrubs, forbs, grasses and grasslikes seldom exceeds 150 pounds per acre.

E. Seral conditions:

Successional development in this type following logging appears to follow two courses depending on the method of slash disposal. Where burning is practiced for slash disposal, the general aspect of the early succession is characterized by abundant forbs primarily stream illiamna (Illiamna rivularis), but quickly changes to a shrubby aspect dominated by snowbush (Ceanothus velutinus). The number, size and vigor of seral species is much lower in this type than in any other of the Douglas fir types.

Where slash is left on the ground or is piled and burned, the unburned areas follow a successional pattern that results in a grass dominated succession particularly in the early stages. Important species may include: Bottlebrush squirreltail (Sitanion hystrix), bluebunch wheatgrass (Agropyron spicatum), Idaho fescue (Festuca idahoensis), elk sedge (Carex geyeri) and Ross sedge (Carex rossii). Fire species such as stream illiamna (Illiamna rivularis) and snowbush ceanothus (Ceanothus velutinus) occur where slash was piled and burned, but the general aspect is grassy in the early stages of succession. The period of time that the initial succession remains grass dominated is unknown, but some sites that were examined were still so dominated ten years after cutting.

F. Disease and insect problems:

This type is highly susceptible to Douglas fir dwarf mistletoe (Arceuthobium douglasii) attack apparently due to the slow growth rate and relatively open nature of the stand. The slow growth rate permits upward movement of the disease in the tree, and the relatively low stocking rate promotes lateral spread because of the lack of shading. Most stands of the Douglas fir/snowberry type that were examined were rather severely infected with dwarf mistletoe.

Both the Douglas fir beetle and spruce budworm occur in the study area. Their activity is relatively low at present with some problems occurring in localized areas.

The mountain pine beetle occurs in seral lodgepole pine on the vegetation type.

G. Key indicators:

This type is characterized by a rather open understory with shrubs dominant, but with some forbs and grasses. Usually snowberry is the main understory dominant. The Douglas fir trees are short in stature, often heavily infested with dwarf mistletoe. Soils are usually rocky but may be well developed in areas of low effective precipitation.

This type may be confused with the Douglas fir/elk sedge-snowberry type but can be distinguished by the high understory coverage of elk sedge in the latter type as opposed to the very open, more shrubby understory in the Douglas fir/snowberry.

The Douglas fir/snowberry is more common on north and east exposures, while the Douglas fir/elk sedge-snowberry is common on south and west exposures.

H. Others who have described similar types:

Reed (1969).

Douglas fir/elk sedge-snowberry - (Pseudotsuga menziesii/Carex geyeri-Symphoricarpos oreophilus)

A. Geology and land types:

The Douglas fir/elk sedge-snowberry type occurs on soils derived from all three of the major geologic materials found in the area, the Volcanics, Sedimentaries, and Granitics.

Land groups on which this type is found include the Sawtooth Moraine land, Depositional lands, rock structured Glaciated lands below 8,000 feet, and the Mountain land groups.

B. Elevation and aspect:

The Douglas fir/elk sedge-snowberry type occurs from 6,000 to approximately 8,000 feet and usually on southerly exposures and benches. It occasionally occurs on more northerly exposures on relatively dry sites as well.

C. Species composition:

Species composition of this type is very similar to that of the Douglas fir/snowberry type except that the crown cover of Douglas fir is relatively open and the crown canopy of understory species is relatively high. Elk sedge (Carex geyeri), is the major understory dominant and often has a crown canopy coverage as high as 25 to 30 percent.

Other important species present include:

Symphoricarpos oreophilus - Snowberry
Ribes cereum - Wax currant
Ribes viscosissimum - Sticky currant
Sitanion hystrix - Squirreltail
Agropyron trachycaulum - Slender wheatgrass
Berberis repens - Creeping barberry
Arnica cordifolia - Heartleaf arnica
Geranium viscosissimum - Sticky geranium
Agropyron spicatum - Bluebunch wheatgrass
Artemisia tridentata ssp. vaseyana - Mountain big sagebrush

D. Productivity:

Timber productivity is variable, but generally tends to be moderate to moderately low on the more rocky sites, varying in site index from 55 to 75. Site index is relatively high on ground moraines, glacial plastered slopes and some mountain lands with well developed soils, and may approach 100 although the average is from 75 to 85.

Productivity of the understory species averages from 200 to 500 pounds per acre. One Douglas fir stand that had been opened up by selective logging, had an understory production of 1,100 pounds

per acre. More than one-third of this production was made up by Ceanothus velutinus (snowbush ceanothus).

E. Seral conditions:

Some relatively recent burns were discovered in this type. Major understory species to be found for the first few years following burning include:

Illiamna rivularis - Stream illiamna
Agropyron spicatum - Bluebunch wheatgrass
Sitanion hystrix - Squirreltail
Carex geyeri - Elk sedge
Symphoricarpos oreophilus - Snowberry
Ceanothus velutinus - Snowbush

Production of these major dominants varied according to the site productivity. Those sites with well developed soils achieved a production of well above 1,000 pounds per acre, whereas production on more rocky sites seldom exceeded 300 to 400 pounds per acre.

Ceanothus velutinus continued to be well represented on one burn over 30 years of age that was examined.

Lodgepole pine is usually the dominant seral tree. Some aspen occurred but was never found to be a seral dominant.

F. Disease and insect problems:

Douglas fir stands on areas with low site productivity, due to rocky soil, appear highly prone to dwarf mistletoe attack at a young age. Douglas fir stands on the more productive sites tend to be resistant to mistletoe until a relatively old age is reached (150 years plus).

Both the Douglas fir beetle and spruce budworm occur in the study area. Their activity is relatively low at present with some problems occurring in localized areas.

The mountain pine beetle occurs in seral lodgepole pine on this vegetation type.

G. Key to indicators:

The Douglas fir/elk sedge-snowberry is characterized by an open understory with elk sedge as the primary understory dominant. The Douglas fir/snowberry is more common on north and east exposures, while the Douglas fir/elk sedge-snowberry is common on south and west exposures.

H. Others who have described similar types:

None.

Douglas fir/tall shrubs

A. Geology and land type:

This type was found exclusively on soils derived from sedimentary geology. It was found at three locations in the study area on Mountain lands and Glaciated lands.

B. Elevation and aspect:

This type was found from 6,500 to 8,000 feet on northerly exposures.

C. Species composition:

Douglas fir is the overstory dominant in this type. Major understory species include:

Symphoricarpos oreophilus - Snowberry
Acer glabrum - Rocky Mountain maple
Amelanchier alnifolia - Saskatoon serviceberry
Ribes cereum - Wax currant
Ribes viscosissimum - Sticky currant
Rosa sp. - Rose
Lonicera utahensis - Utah honeysuckle
Spirea betuilfolia - White spirea
Pyrola secunda - Sidebells pyrola
Arnica cordifolia - Heartleaf arnica
Clematis columbiana - Columbian clematis
Carex geyeri - Elk sedge
Calamagrostis rubescens - Pinegrass

D. Productivity:

The site index for Douglas fir on the sites examined was found to be between 80 and 90. Understory production was estimated at between 500 and 800 pounds per acre with more than half in the form of shrub production.

E. Seral conditions:

The Douglas fir/tall shrubs type is thought to be the type on which Lyon (1966) and Lyon (1971) studied the vegetal development following prescribed burning. American dragonhead (Moldavica parviflora) was the initial dominant for the first two years. For the next three years stream illiamna (Illiamna rivularis) and fireweed (Epilobium angustifolium) were the major dominants. In the sixth year snowbush (Ceanothus velutinus) became the dominant species. All of the major tall shrubs that characterize the community resprouted following the fire.

F. Disease and insect problems:

Very little Douglas fir dwarf mistletoe was found to be present in this type. Information on other disease and insect incidence is unknown.

G. Key indicators:

This type is easily recognized by the predominance of shrubs such as snowberry, Rocky Mountain maple, and serviceberry with abundant forbs. No other Douglas fir type has this combination of species.

H. Others who have described similar types:

None.

III. Subalpine fir-Engelmann spruce

Subalpine fir/grouse whortleberry

A. Geology and land types:

This type is most common on soils derived from granitic material, although it is also found on sedimentary materials. It occurs on Mountain lands, Glaciated lands, and on benches and terraces of both the Depositional lands and the Sawtooth Moraine lands. Soils are usually very gravelly loams.

B. Elevation and aspect:

In the eastern and southern parts of the area this type occurs primarily above 8,000 feet on north slopes and benches. In the cooler northern and western part of the area it may occur as low as 6,500 feet on any aspect.

C. Species composition:

Subalpine fir exhibits superior reproduction in most of the stands examined, although in some Engelmann spruce (Picea engelmannii) may now dominate and be reproducing well. Both species may be dominant in stable stands.

1. Species always found in the understory include:

Vaccinium scoparium - Grouse whortleberry
Arnica cordifolia - Heartleaf arnica
Carex geyeri - Elk sedge

2. Species usually found in the understory include:

Valeriana sitchensis - Sitka valerian
Osmorhiza chilensis - Sweetroot
Calamagrostis rubescens - Pinegrass

3. Species that may be found in the understory include:

Lonicera utahensis - Utah honeysuckle
Ledum glandulosum - Western ledum
Epilobium angustifolium - Fireweed
Pedicularis racemosa - Sickletop pedicularis
Achillea millefolium lanulosa - Western yarrow
Pyrola secunda - Sidebells pyrola

In a variant of the Subalpine fir/grouse whortleberry type, the understory is dominated by Vaccinium caespitosum (dwarf blueberry). This variant was found almost exclusively on glacial outwash terraces and moraines in and around Sawtooth Valley and Stanley

Basin. Although Vaccinium scoparium and V. caespitosum occurred adjacent to one another the V. caespitosum seemed more common on slightly drier environments than the V. scoparium. Occurrence of associated species supported this view. Carex geyeri, Festuca idahoensis, Senecio cymbalarioides, Antennaria rosea and Achillea millefolium were major subdominants in the V. caespitosum variant.

D. Productivity:

No site index data was taken on this type. Understory production is made up primarily of Vaccinium scoparium. Annual production is generally less than 300 pounds to the acre.

E. Seral conditions:

Lodgepole pine is the most important seral tree in the Subalpine fir/grouse whortleberry type. A half or more of the stands examined were currently dominated by this seral tree. Wildfire or cutting followed by slash burning is the main trigger to cause the establishment of seral lodgepole pine on Subalpine fir/grouse whortleberry sites. None of the stands examined were very recently burned, but it appeared that the understory composition ten years or so after a burn differed little from that to be expected in a stand in more nearly stable condition with a subalpine fir overstory.

F. Disease and insect problems:

Root rot caused by Fomes annosus is the most important disease problem in this type. The disease is fostered by any activity which creates fresh stumps or wounds in the trees. Subalpine fir is particularly susceptible to this rot. In some stands this root rot is changing the composition of the stands by removing subalpine fir and favoring Engelmann spruce.

Roe and Amman (1970) found that seral stands of lodgepole pine occurring on Subalpine fir/grouse whortleberry sites had the "highest index of dwarf mistletoe infection" when compared to seral lodgepole pine or either the Subalpine fir/mountain lover (Abies lasiocarpa/Pachistima myrsinites) or the Douglas fir/pinegrass (Pseudotsuga menziesii/Calamagrostis rubescens habitat type. However, seral lodgepole pine on the Subalpine fir/grouse whortleberry had "the lowest index of mountain pine beetle infestation."

The spruce beetle (Dendroctomus obesus) infects Engelmann spruce trees but the activity is limited and causes no problems.

G. Key indicators:

The presence of an abundant grouse whortleberry cover in the understory is the primary indicator of the type. In some sites, however, a less abundant cover of grouse whortleberry, but with

pinegrass (Calamagrostis rubescens) quite abundant, may cause difficulty in lodgepole pine dominated seral stands. The problem is compounded when neither Douglas fir nor Subalpine fir are present to indicate the direction of succession.

H. Others who have described similar types:

Daubenmire and Daubenmire (1968).

Subalpine fir/elk sedge (Abies lasiocarpa/Carex geyeri)

A. Geology and land types:

This type occurs on soils derived from all three of the major geologic materials, Granitics, Sediments, and Volcanics. Soils are usually very gravelly loams. The Subalpine fir/elk sedge is more prominent at higher elevations, and occurs on Granitic Glaciated lands, Glaciated lands, Depositional lands, Sawtooth Moraine lands, and in a few local areas on Mountain lands.

B. Elevation and aspect:

The Subalpine fir/elk sedge type occurs commonly at elevations above 8,000 feet, but as low as 7,000 feet in the northern and western part of the area. All aspects may be occupied, but it occurs more commonly on south and west exposures and benches. This type is the south slope equivalent of the Subalpine fir/snowberry and the Subalpine fir/grouse whortleberry types.

C. Species composition:

In the upper altitudinal range of this type, whitebark pine (Pinus albicaulis) is subdominant with subalpine fir. At lower elevations, particularly on more open sites, lodgepole pine may be an important subdominant. Lodgepole pine is also the most important seral species, and extensive stands of the Subalpine fir/elk sedge are now dominated by this tree.

In wetter pockets Engelmann spruce (Picea engelmannii) is an important subdominant.

1. Understory species always found include:

   Carex geyeri - Elk sedge

2. Understory species usually found include:

   Festuca idahoensis - Idaho fescue
   Lupinus argenteus - Silvery lupine
   Penstemon attenuatus - Sulphur penstemon
   Solidago multiradiata - Low goldenrod
   Achillea millefolium lanulosa - Western yarrow
   Hieracium albertinum - Hawkweed
   Arnica cordifolia - Heartleaf arnica

3. Understory species that may be found include:

   Poa nervosa - Wheeler bluegrass
   Senecio cymbalarioides - Cleftleaf groundsel
   Sitanion hystrix - Bottlebrush squirreltail
   Carex rossii - Ross sedge

D. Productivity:

No site index data was taken on this type. Understory production is made up primarily of elk sedge and seldom exceeds 300 to 500 pounds per acre.

E. Seral conditions:

Following burning of the Subalpine fir/elk sedge type, lodgepole pine is the major seral dominant. Extensive areas of relatively pure lodgepole pine exist with little apparent encroachment by subalpine fir. When fires are sufficiently hot and large enough to eliminate subalpine fir, the reinvasion of this species is very slow.

After hot fires the understory may become depauperated of forbs and some reduction in elk sedge may result. Following cooler fires, however, forbs and grasses are encouraged with the appearance of some species nonindigenous to the type. Included among the species that increase are Solidago multiradiata, Senecio integrifolius and Penstemon attenuatus. Few, if any, shrubs are normally found in the type, and there is apparently no increase of the shrub group following burning.

F. Disease and insect problems:

Root rot caused by Fomes annosus is the most important disease problem. The disease is fostered by any activity which creates fresh stumps or wounds in the trees. Subalpine fir is particularly susceptible to this rot.

Fir engravers Scolytus spp. have been found in subalpine fir, but are not considered a problem.

Spruce beetle (Dendroctonus obesus) infects Engelmann spruce, but thus far the activity is limited and causes no problems.

The mountain pine beetle (Dendroctonus ponderosae) occurs both in seral lodgepole pine stands and in higher elevation whitebark pine trees associated with the Subalpine fir/elk sedge type. The susceptibility of trees in this type relative to other vegetation types is unknown. However, the mountain pine beetle has caused extensive losses of whitebark pine trees in the past and still occurs in widely scattered localized areas.

G. Key indicators:

This type is relatively easy to distinguish because of the prominence of elk sedge as the major understory dominant. However, in areas that have been heavily grazed by sheep in the past the elk sedge may be absent and a combination of Idaho fescue lupines, and forbs predominate. Grouse whortleberry is usually absent from the type although it may be present in pockets.

This type grades into the Whitebark pine/barren type at higher elevations. The major indicator of the latter is the stunted trees with a predominance of pine. Elk sedge may or may not be a prominent understory plant. Elements of the cushion plant community are usually present, particularly sandwort (Arenaria aculeata).

H. Others who have described similar types include:

None.

Subalpine fir/snowberry (Abies lasiocarpa/Symphoricarpos oreophilus)

A. Geology and land types:

This type occupies extensive areas of forested land immediately above the Douglas fir/snowberry (Pseudotsuga menziesii/Symphoricarpos oreophilus). It occurs on all three of the major geologic materials, Granitics, Sediments, and Volcanics. Land types on which the Subalpine fir/snowberry is found include Glaciated lands, Valley Train, Glacial Plastered Slope land, and some higher elevation Mountain lands.

B. Elevation and aspect:

The Subalpine fir/snowberry occurs at elevations of 7,800 feet or above, but may be lower in the northern and western part. It is characteristic of north and east exposures and rarely occurs on southerly exposures.

C. Species composition:

Abies lasiocarpa (subalpine fir) is the most abundantly reproducing tree species, with Engelmann spruce (Picea engelmannii) and (Pinus albicaulis) whitebark pine as subdominants. Lodgepole pine (Pinus contorta) is the most common seral species although Douglas fir (Pseudotsuga menziesii) may be seral below elevations of 8,000 feet. Growth form of the latter is always poor in this type.

1. Species always present include:

Symphoricarpos oreophilus - Snowberry
Pyrola secunda - Sidebells pyrola
Arnica cordifolia - Heartleaf arnica
Aquilegia formosa - Columbine

2. Species usually present include:

Ribes montigenum - Gooseberry currant
Epilobium angustifolium - Fireweed
Poa nervosa - Wheeler bluegrass
Carex geyeri - Elk sedge
Lupinus argenteus - Silvery lupine
Senecio cymbalarioides - Cleftleaf groundsel
Ribes lacustre - Prickly currant
Osmorhiza chilensis - Sweetroot

3. Species that may be present include:

Juniperus communis - Mountain common juniper
Shepherdia canadensis - Russet buffaloberry
Carex rossii - Ross sedge
Goodyera oblongifolia - Western rattlesnake plantain
Valeriana sitchensis - Sitka valerian
Aster conspicuus - Showy aster

D. Productivity:

No timber productivity data was taken in this type. Understory production seldom exceeds 150 pounds per acre and is made up primarily of forbs and shrubs with only a minor component of grasses and grasslikes.

E. Seral conditions:

None observed.

F. Disease and insect problems:

Root rot caused by Fomes annosus is the most important disease problem in this type. The disease is fostered by any activity which creates fresh stumps or wounds in the trees. Subalpine fir is particularly susceptible to this rot.

Fir engravers (Scolytus spp.)have been found in subalpine fir but are not considered a problem.

Spruce beetle (Dendroctonus obesus) infects Engelmann spruce, but thus far the activity is limited and causes no problems.

The mountain pine beetle (Dendroctonus ponderosae) occurs both in seral lodgepole pine stands and in higher elevation whitebark pine trees associated with the Subalpine fir/snowberry type. The susceptibility of trees in this type relative to other vegetation types is unknown. However, the mountain pine beetle has caused extensive losses of whitebark pine trees in the past and still occurs in widely scattered localized areas.

G. Key indicators:

This type is easy to distinguish because of the forb-shrub understory that is very open with low productivity per acre. It also is found almost exclusively on north and east exposures.

H. Others who have described similar types:

Reed (1969) described the Abies lasiocarpa/Pyrola secunda type. Some of his stands have similar characteristics to the Subalpine fir/snowberry.

Subalpine fir-Engelmann spruce/western ledum (Abies lasiocarpa-Picea engelmannii/Ledum glandulosum)

A. Geology and land types:

This type occurs on all three of the major geologic materials, Granitics, Sedimentaries, and Volcanics. It is almost exclusively a bottom land type of high elevations and occurs in Cirque Basins, Valley Train, and Alluvial lands in the Strongly Glaciated, and the Sawtooth Moraine land groups.

B. Elevation and aspect:

This type is most common above 8,000 feet, but may occur as low as 7,000 feet in Stanley Basin. It occurs in relatively flat bottoms and on north slopes in poorly drained situations.

C. Species composition:

Engelmann spruce tended to dominate in most stands that were examined, although subalpine fir was often a codominant.

1. Understory species always present are:

Ledum glandulosum - Western ledum
Phyllodoce empetriformis - Red mountainheath
Ribes montigenum - Gooseberry currant
Arnica cordifolia - Heartleaf arnica
Carex spp. - Carex
Salix spp. - Willow

2. Understory species usually present are:

Vaccinium scoparium - Grouse whortleberry
Lonicera utahensis - Utah honeysuckle
Lonicera involucrata - Bearberry honeysuckle
Ribes lacustre - Prickly currant
Cassiope mertensiana - Mertens cassiope

3. Understory species that may be present are:

Pedicularis groenlandica - Elephanthead lousewort
Sibbaldia procumbens -
Mimulus lewisii - Lewis monkeyflower
Senecio serra - Butterweed groundsel
Senecio triangularis - Arrowleaf groundsel
Trisetum spicatum - Wolfs trisetum
Chionophila tweedyi - Snowlover
Mimulus guttatus - Common monkeyflower

Ledum glandulosum is the dominant understory plant at lower elevations. At higher elevations Phyllodoce empetriformis becomes a codominant in the understory.

D. Productivity:

No timber site index data was taken for this type. Understory production tends to be predominatly shrubs, although the Carex group often produces up to half of the total. Total understory production seldom exceeds 500 pounds per acre.

E. Seral conditions:

A natural progression from mountain meadow to the Subalpine fir-Engelmann spruce/western ledum type occurs in many Cirque Basin areas. Between the meadow and the timber is a zone with the understory species of western ledum and red mountain heath as major dominants. A few scattered spruce and fir may be found as well. This change apparently represents a stage in primary succession from meadow to forest.

No disturbed stands of the Subalpine fir-Engelmann spruce/western ledum were noted in which conditions of secondary succession in the type could be observed.

F. Disease and insect problems:

Root rot caused by Fomes annosus is the most important disease problem in this type. The disease is fostered by any activity which creates fresh stumps or wounds in the trees. Subalpine fir is particularly susceptible to this rot.

Fir engravers (Scolytus spp.) have been found in subalpine fir but are not considered a problem.

Spruce beetle (Dendroctonus obesus) infects Engelmann spruce, but thus far the activity is limited and causes no problems.

The mountain pine beetle (Dendroctonus ponderosae) occurs in seral lodgepole pine stands. The susceptibility of trees in this type relative to other vegetation types is unknown.

G. Key indicators:

This type is easily identified by its location in wet bottom sites and the presence of western ledum and red mountain heath as the primary understory species. However, ecotones between meadow types dominated by willows, western ledum, and red mountain heath cause some problem, as do ecotones between the Engelmann spruce-subalpine fir/bluejoint reedgrass.

H. Others who have described similar types:

None.

Engelmann spruce-subalpine fir/bluejoint reedgrass
(Picea engelmannii-Abies lasiocarpa/Calamagrostis canadensis)

A. Geology and land types:

This type occurs on Glacial Outwash, Ground Moraines, and Alluvial types on all three major geologic materials, but is most common on soils derived from granitic material. It occurs at the lower elevations of Sawtooth Valley and Stanley Basin on the major feeder streams of the Upper Salmon River.

B. Elevation and aspect:

This type was found to occur from 6,500 to 8,500 feet in elevation and exclusively in a bottom location adjacent to a stream.

C. Species composition:

This type tends to be somewhat variable in composition with elements of adjacent meadow communities such as willows and sedges being locally abundant, or elements of the Subalpine fir-Engelmann spruce/western ledum type encroaching at higher elevations. However, bluejoint reedgrass is always abundant in the understory and tends to give the type a grassy appearance in spite of locally abundant shrubs. Species usually found include:

Picea engelmannii - Engelmann spruce
Abies lasiocarpa - Subalpine fir
Pinus contorta - Lodgepole pine
Calamagrostis canadensis - Bluejoint reedgrass
Salix spp. - Willow
Ledum glandulosum - Western ledum
Carex spp. - Sedges
Vaccinium spp. - Blueberry, Huckleberry, Whortleberry

D. Productivity:

Data on timber production was not obtained for this type. Understory production usually exceeded 1,500 pounds per acre.

E. Seral conditions:

Many of the stands observed in this type were in seral condition, dominated by lodgepole pine. Although lodgepole pine reproduces well in these bottom land sites, the abundance of spruce and subalpine fir regeneration suggests that the latter two species will ultimately dominate the site.

F. Disease and insect problems:

Root rot caused by Fomes annosus is the most important disease problem in this type. The disease is fostered by any activity which creates fresh stumps or wounds in the trees. Subalpine fir is particularly susceptible to this rot.

Fir engravers (Scolytus spp.) have been found in subalpine fir but are not considered a problem.

Spruce beetle (Dendroctonus obesus) infects Engelmann spruce, but thus far the activity is limited and causes no problems.

The mountain pine beetle (Dendroctonus ponderosae) occurs in seral lodgepole pine stands. The susceptibility of trees in this type relative to other vegetation types is unknown.

G. Key indicators:

This type is easily identified by its location in wet bottom sites and the conspicuous presence of bluejoint reedgrass. However, the ecotones between the meadow types dominated by willows and the Subalpine fir-spruce/western ledum types are often found making difficult clearcut separations in such situations.

H. Others who have described similar types:

Pfister - personal communication.

Engelmann spruce-subalpine fir/tall forb

This type was found in only one area on the Left Fork of Iron Bog Creek on the Mackay Ranger District, Challis National Forest. Soils were very deep, clay loams, saturated throughout the year and derived from sedimentary geologic material. Area located was at approximately 8,000 feet on a north slope. Land type was glaciated lands.

The overstory dominant was Engelmann spruce (Picea engelmannii) with some subalpine fir (Abies lasiocarpa) also present. Only an incomplete species list was obtained. Major understory species included:

Thalictrum sp. - Meadowrue
Smilacina sp. - Solomonplume
Valeriana sp. - Valerian
Veratrum californicum - California false hellebore
Senecio triangularis - Arrowleaf groundsel
Ribes cereum - Wax currant
Heuchera parviflora - Littleleaf alumroot
Heracleum lanatum - Common cowparship
Pyrola uniflora - Single beauty pyrola
Streptopus amplexifolius - Claspedleaf twistedstalk

Total understory production was high - estimated at 800 pounds per acre under a quite dense overstory.

IV. lodgepole Pine

Lodgepole pine-Idaho fescue (Pinus contorta/Festuca idahoensis)

A. Geology and land types:

This type is restricted to the Depositional and Sawtooth Moraine land groups on moraines, glacial outwash and terrace lands. While it is most prominent on granitic material, reworked gravels of many geologic origins are included on these sites.

B. Elevation and aspect:

The type is most often found between 6,000 and 8,000 feet on flat to gently rolling moraines or outwash benches.

C. Species composition:

The Lodgepole pine/Idaho fescue type is apparently the result of lodgepole pine invading on Artemisia tridentata ssp. vaseyana/Festuca idahoensis (Mountain big sagebrush/Idaho fescue), Artemisia arbuscula ssp. thermopola/Festuca idahoensis (Thermopola low sagebrush/Idaho fescue) or Artemisia tridentata ssp. vaseyana form spiciformis/Bromus marginatus-Festuca idahoensis (Subalpine big sagebrush/big mountain brome-Idaho fescue) types.

The initial invasion of lodgepole pine results in a gradual reduction in the amount of sagebrush in the stand. As the canopy of lodgepole closes, the sagebrush is completely eliminated but Idaho fescue remains as the major understory dominant. Because the site is marginal for lodgepole pine, the growth of this tree is very slow. Douglas fir and subalpine fir, the two tree species that normally succeed lodgepole pine on other timbered types, are rarely found on the Lodgepole pine/Idaho fescue type.

It is suspected that the unfavorable microclimate that exists on the Depositional lands on which this lodgepole pine invasion takes place, is gradually overcome as the young trees invade and create an environment more suitable for themselves.

1. Species always found include:

Pinus contorta - Lodgepole pine
Festuca idahoensis - Idaho fescue

2. Species usually found include:

Artemisia tridentata ssp. vaseyana - Mountain big sagebrush
Artemisia tridentata ssp. vaseyana form spiciformis - Subalpine sagebrush
Artemisia arbuscula ssp. thermopola - Thermopola low sagebrush
Carex geyeri - Elk sedge
Lupinus argenteus - Silvery lupine
Antennaria rosea - Rose pussytoes
Sitanion hystrix - Bottlebrush squirreltail

3. Species that may be present include:

Calamagrostis rubescens - Pinegrass
Symphoricarpos oreophilus - Snowberry
Oryzopsis exigua - Little ricegrass
Poa sandbergii - Sandberg bluegrass
Phlox hoodii - Hood's phlox
Arenaria aculeata - Sandwort

D. Productivity:

Site index for lodgepole pine was not taken. Understory production primarily made up of Idaho fescue is approximately 200 to 300 pounds per acre.

E. Seral conditions:

The creation of the Lodgepole pine/Idaho fescue type occurs through long term invasion by lodgepole pine of big and low sagebrush/Idaho fescue types. Many of the species characteristic of the sagebrush-grass types remain as important understory components of the lodgepole pine dominated stand.

F. Disease and insect problems:

Lodgepole pine dwarf mistletoe occurs in this type but is not important in terms of total numbers of individuals infected.

The mountain pine beetle occurs in these stands, but it too does not appear to be a serious problem.

G. Key indicators:

Lodgepole pine is the sole overstory tree. In seral condition some sagebrush is present with Idaho fescue as the predominant grass cover. Under a closed canopy of lodgepole pine, sagebrush is almost totally absent, and Idaho fescue is a nearly pure understory stand. The type is restricted to the Depositional land group.

It is difficult to determine if a Mountain big sagebrush/Idaho fescue type will be successfully invaded by lodgepole pine or not. Conditions necessary for such an invasion are unknown at present. However, some of the Mountain big sagebrush/Idaho fescue type is suspect and may be invaded in the future. No other type may be confused with the Lodgepole pine/Idaho fescue type.

H. Others who have described similar types:

None.

V. Whitebark Pine

Whitebark pine/barren (Pinus albicaulis)

A. Geology and land types:

This type occurs on the Strongly Glaciated and Glaciated land groups on soils derived from all three major geologic materials, Volcanic, Sedimentary, and Granitic. It is particularly characteristic of ridgetop and near-ridgetop locations in the High Elevation Upland and Upland land types, but also occurs in small pockets throughout the Strongly Glaciated and Glaciated land groups.

B. Elevation and aspect:

The type is confined to elevations above 8,000 feet and occurs on all aspects.

C. Species composition:

The type is designated by whitebark pine (Pinus albicaulis) but limber pine (Pinus flexilis) was also occasionally found. The two species are virtually indistinguishable without the presence of cones. Subalpine fir (Abies lasiocarpa) and lodgepole pine (Pinus contorta) may or may not be present in the type.

The understory tends to be variable. In local situations elk sedge (Carex geyeri) is dominant, while in others elements of the cushion plant community, particularly sandwort (Arenaria aculeata), predominate.

Other species found in the understory include fleabane (Erigeron peregrinus), aster (Aster alpigenus), silvery lupine (Lupinus argenteus), rose pussytoes (Antennaria rosea) and varileaf cinquefoil (Potentilla diversifolia).

D. Productivity:

Very low.

E. Seral conditions:

Unknown.

F. Disease and insect problems:

The mountain pine beetle (Dendroctonus ponderosae) occurs in whitebark pine and has caused extensive losses in the past. Although localized infestations still may be found, they are not very extensive nor do they apparently constitute a problem.

G. Key indicators:

This type has a quite variable understory that with additional study could undoubtedly be further subdivided. However, the open stands of whitebark pine with some scattered subalpine fir are key indicators of the type.

This type merges with the Subalpine fir/elk sedge type and at times separation of the two is difficult. Such separations can be made based on the abundance of subalpine fir in the overstory and elk sedge in the understory.

H. Others who have described the type:

Lewis and Riegelhuth (1964).

U. S. Forest Service Range Environmental Analysis Handbook (R-6) describes an alpine fir-whitebark pine type with similar characteristics.

Daubenmire and Daubenmire (1968) describe a Pinus albicaulis-Abies lasiocarpa type but it is quite different in understory composition.

VI. Aspen

Aspen/snowberry-elk sedge (*Populus tremuloides/Symphoricarpos oreophilus-Carex geyeri*)

A. Geology and land types:

This type is commonly associated with Hillslope lands, Mountain lands, Depositional lands, and Lower Elevation Glaciated lands. It may be found on all three major geologic materials, and its distribution is more strongly governed by the amount of available soil moisture and temperature than by geologic differences.

B. Elevation and aspect:

Permanent aspen stands may be found on all aspects, but are generally restricted in elevational distribution to areas below 8,500 feet.

C. Species composition:

The species composition of the permanent aspen stands examined were highly variable due to grazing disturbance by both sheep and cattle that is common throughout the area. Species found in the least disturbed stands include:

Populus tremuloides - Trembling aspen
Carex geyeri - Elk sedge
Symphoricarpos oreophilus - Mountain snowberry
Geranium viscosissimum - Sticky geranium
Hydrophyllum capitatum - Bullhead waterleaf
Senecio serra - Butterweed groundsel
Thalictrum occidentale - Western meadowrue
Potentilla glandulosa - Gland cinquefoil
Smilacina racemosa - Fat Solomonplume
Smilacina stellata - Starry Solomonplume
Achillea millefolium - Western yarrow
Fragaria virginiana - Strawberry
Aquilegia formosa - Sitka columbine
Festuca idahoensis - Idaho fescue
Lupinus sp. - Lupine
Artemisia tridentata ssp. *vaseyana* - Mountain big sagebrush
Taraxacum officinale - Common dandelion
Valeriana sitchensis - Sitka valerian
Osmorhiza occidentalis - Sweet anise
Penstemon attenuatus - Sulphur penstemon
Stipa columbiana - Subalpine needlegrass
Poa nervosa - Wheeler bluegrass
Agropyron subsecundum - Bearded wheatgrass

D. Productivity:

Production of understory species in permanent aspen stands varied from 500 to 2,000 pounds per acre. No estimate of aspen wood production was made.

E. Seral conditions:

At higher elevations aspen is unable to compete as a climax dominant with the coniferous trees. At lower elevations permanent stands of aspen may be found within and below the Mountain land group in an intermediate position between the sagebrush-grass and the Douglas fir types. Aspen is an important seral species in the Douglas fir and some of the subalpine fir types. At times seral aspen may be difficult to distinguish from permanent aspen. However, the understory composition, together with the presence or absence of coniferous tree reproduction, is a good indicator for separation.

Most of the aspen stands examined were in one way or another disturbed by grazing, and in many cases excessive grazing. As a result, the basic species composition of the understory in these stands differed considerably. Particularly in areas subjected to heavy sheep grazing as along the Ketchum-Stanley Sheep Driveway, a predominance of a grass understory was found. Usually Agropyron trachycaulum (slender wheatgrass) Melica bulbosa (oniongrass), Agropyron spicatum (bluebunch wheatgrass), Bromus marginatus (big moungain brome), and Festuca idahoensis (Idaho fescue), were among the more important species found. Shrubs and forbs were less common than in stands not subject to sheep grazing pressure, but Symphoricarpos oreophilus (snowberry) and Osmorhiza occidentalis (sweet anise) were usually found. Forb species more characteristic of disturbed sites such as Collinsia parviflora (littleflower collinsia), Nemophylla breviflora (Great Basin baby-blue-eyes), Descurainia richardsonii (Richardson tansy-mustard), and Lomatium dissectum (carrotleaf leptotaenia) were also common. Carex geyeri (elk sedge), was not usually present or only poorly represented on such sites.

Because of the disturbed conditions that were found, only one aspen type was described. It is suspected, however, that careful study would reveal several additional types that could be distinguished.

F. Insect and disease problems:

Aspen is subject to three primary disease problems: First, aspen twig and leaf blight caused by the fungus Marssonina populi. This organism causes brown and black spotting of the leaf. The impact on the tree is usually minor although it may predispose them to attack by other organisms.

Second, trunk cankers that may be caused by any one of five different fungus organisms. These cankers can cause tree mortality.

Third, heart rot caused by fungus organisms. The most common is Fomes igniarius. This pathogen is also a cause of aspen mortality. On poor sites saplings as well as older trees are infected, but on better sites only the large older trees are attacked.

G. Key indicators:

The diversity of understory forb species, the presence of forb species associated more mesic conditions than is found in Douglas fir types, and the lack of abundant coniferous reproduction are the key indicators of permanent aspen stands. Problems arise in making clearcut distinctions between seral aspen stands and permanent aspen stands when a few reproducing conifers are present, but the understory composition is not clearly indicative of either a climax conifer type or a permanent aspen type. Such conditions are common in heavily grazed stands or stands that have been altered due to changes in water table level because of soil disturbance. These stands require a separate classification due to the altering environmental conditions.

H. Others who have described similar types:

Reed (1969).

VII. Curlleaf Mountain Mahogany

Curlleaf mountain mahogany/bluebunch wheatgrass
(Cercocarpus ledifolius/Agropyron spicatum)

A. Geology and land types:

This vegetation type is found closely associated with limestone and occurs primarily on Sedimentary geologic materials. A few stands were found on rocky outcrops on both Granitic and Volcanic materials as well. Stands were found on the Hillslope lands, Glaciated lands, and Mountain lands on the easternmost part of the area.

B. Elevation and aspect:

The type was found at elevations between 7,000 and 8,000 feet and on all aspects:

C. Species composition:

1. Species always found include:

Cercocarpus ledifolius - Curlleaf mountain mahogany
Agropyron spicatum - Bluebunch wheatgrass
Symphoricarpos oreophilus - Mountain snowberry
Crepis accuminata - Tapertip hawksbeard.

2. Species usually found include:

Artemisia tridentata ssp. vaseyana - Mountain big sagebrush
Phlox longifolia - Longleaf phlox
Lithospermum ruderale - Wayside gromwell
Mertensia oblongifolia - Oblongleaf bluebells
Carex rossii - Ross sedge
Antennaria rosea - Rose pussytoes
Taraxacum officinale - Common dandelion
Descurainia richardsonii - Richardson tansymustard
Phacelia hastata - Scorpionweed
Collinsia parviflora - Littleflower collinsia

3. Species that may be present include:

Festuca idahoensis - Idaho fescue
Hesperochloa kingii - Spike fescue
Tetradymia canescens - Gray horsebrush
Penstemon attenuatus - Sulfur penstemon
Viola nuttallii - Nuttall violet
Eriogonum umbellatum - Sulfur eriogonum
Poa sandbergii - Sandberg bluegrass
Poa fendleriana - Mutton bluegrass
Poa nervosa - Wheeler bluegrass

There are probably two recognizable phases of this vegetation type. The first has an open canopy of mountain mahogany with mountain snowberry, mountain big sagebrush, and bluebunch wheatgrass the primary understory dominants. This phase occurs primarily on southerly or westerly exposures.

The second phase has a very dense canopy of mountain mahogany with an essentially closed overstory. The understory contains a predominance of Idaho fescue, spike fescue, longleaf phlox and some bluebunch wheatgrass. Shrubs other than mountain mahogany are represented by an occasional plant of mountain snowberry. This phase occurs primarily on northerly or easterly exposures.

D. Productivity:

Total annual production for both phases of this vegetation type were estimated at between 500 and 1,500 pounds per acre. In the second phase approximately two-thirds of the total production was by the mahogany overstory.

E. Seral conditions:

Scheldt and Tisdale (1970) indicate that when mountain mahogany stands burn, the burn tends to be complete leaving little evidence of the fire. Regeneration of the mahogany tends to be slow. One stand that was examined by the authors showed that there was a 17-year lag before restocking began. They present evidence that grazing of seedlings is a problem in preventing restocking. Cottontail rabbits were implicated as the primary animal causing this mortality.

Some invasion by mountain mahogany seedlings and saplings into the adjacent sagebrush-grass vegetation was found at some sites. The cause and status of these invasion sites is unknown at this time.

F. Disease and insect problems:

Several insect pests are a problem in mountain mahogany stands. Tent caterpillars (Malacosoma sp.), spiny silk worms (Hemileuca sp.), and a measuring worm (Anacamptodes clivinaria) have been found. The measuring worm has been particularly serious in causing high mortality in mahogany stands (Scheldt and Tisdale, 1970)

G. Key indicators:

The prime indicator is the presence of curlleaf mountain mahogany on the site. There is some evidence that some mountain mahogany stands may be seral to Douglas fir, with Douglas fir eventually taking over. None of the stands examined indicated that they were seral. It is probably that such stands would indicate their seral status by exhibiting a species composition quite different from that shown above and could be separated on that basis.

H. Others who have described similar types:

Scheldt and Tisdale (1970).

VIII. Low Sagebrush

Thermopola low sagebrush/Idaho fescue
(Artemisia arbuscula ssp. thermopola/Festuca idahoensis)

A. Geology and land types:

This type occurs on soils derived from all three of the major geologic materials: Volcanics, Sediments, and Granitics. The type occurs most often on Glacial outwash, Dry alluvial and Terrace lands, but is also common on poorly drained sites in Mountain lands and Glaciated lands. It is a prominent type on rocky ridgetops and on poorly drained soils or sites subject to a lengthy period of saturation during the spring of the year.

B. Elevation and aspect:

This type was found at elevations as high as 9,800 feet, although it is more typically found between 6,000 and 8,800 feet. It may be found on all aspects but generally it occurs on relatively flat benches and ridgetops with slopes of 10 to 15 percent or less.

C. Species composition:

1. Species always present include:

Artemisia arbuscula ssp.thermopola - Thermopola low sagebrush
Festuca idahoensis - Idaho fescue
Poa sandbergii - Sandberg bluegrass
Sitanion hystrix - Bottlebrush squirreltail

2. Species usually present include:

Erigeron compositus - Fernleaf fleabane
Antennaria rosea - Rose pussytoes
Phlox hoodii - Hood's phlox
Cymopterus bipinnatus - Chimaya

3. Species that may be present include:

Koleria cristata - Junegrass
Draba densifolia - Rockcress draba
Aster scopulorum - Crag aster
Haplopappus acaulis - Stemless goldenweed
Eriogonum umbellatum - Sulfur eriogonum
Lewisia rediviva - Bitterroot lewisia
Agropyron spicatum - Bluebunch wheatgrass

An important phase of this type was found on Railroad Ridge at approximately 9,800 feet. This site had Idaho fescue (Festuca idahoensis), Sandberg bluegrass (Poa sandbergii),

sedge (Carex elynoides)as the dominant grass and grasslike species, with prairie smoke (Geum triflorum), Pacific lupine (Lupinus lepidus), (Phlox pulvinata), Hood's phlox (Phlox hoodii) and crazyweed (Oxytropis campestris) as the major associated species. Forbs are more conspicuous in this phase of the type than in other locations.

D. Productivity:

Total production in averages between 100 and 400 pounds per acre. The production on the Railroad Ridge phase of the type was estimated at 350 to 400 pounds per acre with approximately 1/4 to 1/3 of the production made up by the forb species.

E. Seral conditions:

Some stands with little Thermopola low sagebrush and Idaho fescue, and abundant annual and perennial forbs were found on soils and sites similar to those described above. These stands were thought to represent degraded conditions of the type.

F. Key indicators:

The presence of the Thermopola subspecies of low sagebrush with Idaho fescue as the major subdominant are the key indicators of the type. A period of soil saturation for a lengthy period during the spring of the year is also an important characteristic.

It is relatively easy to distinguish between the Thermopola subspecies and Artemisia longiloba, the other low sagebrush species with which it may be confused.

G. Others who have described similar types:

None.

Low sagebrush/bluebunch wheatgrass
(Artemisia arbuscula ssp. arbuscula/Agropyron spicatum)

A. Geology and land types:

In the study area this type was found on soils derived from Challis Volcanic geology or on sites with a mixed parentage. This type is always associated with very shallow or gravelly soils, or soils with a restrictive clay B horizon. In all cases the soils are subject to saturated conditions for a period during some time of the year. The Low sagebrush/bluebunch wheatgrass type is restricted for the most part to Hillslope lands and Glacial outwash terraces with restrictive clay horizons.

B. Elevation and aspect:

This type seldom occurs above 7,000 feet in elevation and usually on flat benches, or south aspects.

C. Species composition:

This type differs from the other low sagebrush types by the predominance of bluebunch wheatgrass as the dominant grass, and the relative scarcity of Idaho fescue. Often Stipa thurberiana (Thurber needlegrass) is a prominent associate in the type.

1. Species always found include:

Artemisia arbuscula ssp. arbuscula - Low sagebrush
Agropyron spicatum - Bluebunch wheatgrass
Sitanion hystrix - Bottlebrush squirreltail
Phlox hoodii - Hood's phlox
Poa sandbergii - Sandberg bluegrass
Crepis acuminata - Tapertip hawksbeard

2. Species usually found include:

Phlox longifolia - Longleaf phlox
Stipa thurberiana - Thurber needlegrass
Koeleria cristata - Junegrass
Eriogonum caespitosum - Mat eriogonum
Sedum stenopetalum - Wormleaf stonecrop
Antennaria rosea - Rose pussytoes

3. Species that may be found include:

Arenaria congesta - Bullhead sandwort
Festuca idahoensis - Idaho fescue
Trifolium gymnocarpon - Hollyleaf clover
Aster scopulorum - Crag aster
Astragalus purshii - Pursh locoweed

Castilleja angustifolia - Northwestern painted-cup
Lupinus spp. - Lupine
Arabis spp. - Rockcress
Lewisia rediviva - Bitterroot lewisia
Taraxacum officinale - Common dandelion

D. Productivity:

Total forage production seldom exceeds 400 pounds per acre and usually averages 100 to 300 pounds per acre.

E. Seral conditions:

No depleted stands of the Low sagebrush/bluebunch wheatgrass type were observed.

F. Key indicators:

The presence of the arbuscula subspecies of low sagebrush with bluebunch wheatgrass as the major dominant are good indicators of the type. Idaho fescue is normally not present.

There is only one other low sagebrush type with a bluebunch wheatgrass subdominant, the Alkali sagebrush/bluebunch wheatgrass type. This type may be distinguished by the presence of the very early flowering form of low sagebrush (alkali sagebrush - Artemisia longiloba). This type was not found on the study area but occurs adjacent to it.

G. Others who have described similar types:

None

Low sagebrush/Idaho fescue
(Artemisia arbuscula ssp. arbuscula/Festuca idahoensis)

A. Geology and land types:

On most of the study area this type occurs on soils derived from Challis Volcanic geology on the Hillslope lands,and on soils of mixed geologic origin on Glacial outwash and Terraces lands. In the observed cases, the soils are shallow to bedrock, gravelly and/or with a restrictive clay B horizon. These soils tend to be subject to saturated conditions for a period during some time of the year.

B. Elevation and aspect:

This type was found at elevations up to 8,000 feet. The type may occur on all aspects, but is most common on relatively flat benches.

C. Species composition:

The Low sagebrush/Idaho fescue type differs from the previously described Low sagebrush/bluebunch wheatgrass by the dominance of Idaho fescue in the former and bluebunch wheatgrass in the latter.

1. Species always present include:

Artemisia arbuscula ssp. arbuscula - Low sagebrush
Festuca idahoensis - Idaho fescue
Phlox hoodii - Hood's phlox
Poa sandbergii - Sandberg bluegrass
Antennaria rosea - Rose pussytoes

2. Species usually found include:

Crepis acuminata - Tapertip hawksbeard
Eriogonum caespitosum - Mat eriogonum
Phlox longifolia - Longleaf phlox
Arenaria aculeata - Sandwort

3. Species that may be found include:

Agropyron spicatum - Bluebunch wheatgrass
Castilleja spp. - Indian paintbrush
Lupinus spp. - Lupine
Arabis spp. - Rockcress

A second phase of this type, the Artemisia longiloba/Festuca idahoensis (alkali sagebrush/Idaho fescue), has virtually the same distribution and species associated with it as the Low sagebrush/Idaho fescue. Although both low sagebrush and the

alkali sagebrush may occur side by side, they were never found mixed together. This fact would indicate distinct habitats for each.

Soil pits dug in both types showed no conspicuous differences visible to the eye, but differences may be of a chemical nature.

D. Productivity:

The forage production of the Low sagebrush/Idaho fescue type usually averages 100 to 400 pounds per acre.

E. Seral conditions:

Unknown.

F. Key indicators:

The presence of the arbuscula subspecies with Idaho fescue as the major subdominant are the major indicators of the type. This type normally occurs lower in elevation than the Thermopola subspecies dominated type. The Artemisia longiloba (alkali sagebrush) dominated types occur at intermediate elevations, but will occur side by side with either of the other subspecies of low sagebrush where their ranges overlap. The species and subspecies were never found mixed, however.

G. Others who have described similar types:

Fosberg and Hironaka (1964)
Lewis (1971)

IX. Threetip Sagebrush

Threetip sagebrush/Idaho fescue (Artemisia tripartita/Festuca idahoensis)

A. Geology and land types:

This type was found on sedimentary Hill Slope lands, and river and glacial outwash terraces of mixed parent material.

B. Elevation and aspect:

This type is generally confined to elevations below 7,300 feet and is most common on relatively flat areas but does occur on all aspects.

C. Species composition:

1. Species always present include:

Artemisia tripartita - Threetip sagebrush
Festuca idahoensis - Idaho fescue
Agropyron spicatum - Bluebunch wheatgrass
Poa secunda - Sandberg bluegrass
Antennaria rosea - Rose pussytoes

2. Species usually present include:

Tetradymia canescens - Gray horsebrush
Leptodactylon pungens - Prickly phlox
Chrysothamnus viscidiflorus - Douglas rabbitbrush
Senecio integerrimus - Lambstongue groundsel
Penstemon humilis - Low penstemon
Phlox hoodii - Hood's phlox

3. Species that may be present include:

Crepis accuminata - Tapertip hawksbeard
Aster scouplorum - Crag aster
Erigeron compositus - Fernleaf fleabane
Phlox longifolia - Longleaf phlox
Taraxacum officionale - Common dandelion
Astragalus spp. - Locoweed

D. Productivity:

Total production averages about 500 pounds per acre in the type, and may vary from 250 to 700 pounds per acre.

E. Seral conditions:

Both sprayed and burned stands of the Threetip sagebrush/Idaho fescue type were observed. Threetip sagebrush sprouts after burning, and is difficult to kill with herbicides. Usually

the increases in understory species are very short lived as within a few years after treatment threetip sagebrush becomes more dense than before treatment.

F. Key indicators:

This type is readily identified by the presence of threetip sagebrush and the understory dominance of Idaho fescue and bluebunch wheatgrass. The type also occurs in an elevational or zone position between the Wyoming big sagebrush/bluebunch wheatgrass type which is the next lower zone and the Mountain big sagebrush/Idaho fescue type the next higher zone.

No other type has a shrub cover of threetip sagebrush in our area. Daubenmire (1970) has described a threetip sagebrush community with Stipa comata (needle-and-thread) as the primary subdominant, but this type was not found in our area.

G. Others who have described similar types:

Daubenmire (1970).

X. Mountain Silver Sagebrush

Mountain silver sagebrush/Idaho fescue (Artemisia cana ssp. viscidula/Festuca idahoensis)

A. Geology and land types:

This type is restricted to the Depositional land group and is usually found on Dry Alluvial, Glacial Outwash, and Terrace lands. The type occurs on reworked material from various geologic origins.

B. Elevation and aspect:

This type occurs from 6,000 to 8,000 feet on relatively level terrain.

C. Species composition:

In addition to mountain silver sagebrush and Idaho fescue the following were the more important species found:

Agropyron trachycaulum - Slender wheatgrass
Carex spp. - Sedges
Potentilla fruticosa - Shrubby cinquefoil
Stipa columbiana - Subalpine needlegrass
Potentilla glandulosa - Gland cinquefoil
Poa sandbergii - Sandberg bluegrass
Poa spp. - Bluegrasses
Eriogonum heracleoides - Wyeth eriogonum
Taraxacum officinale - Common dandelion
Achillea millefolium - Western yarrow

Under most conditions the above listed species predominate, but under drier conditions nearly pure stands of Idaho fescue may be found in the understory. Further study is warranted to see if two distinct types may be separated.

D. Productivity:

Sites examined varied in productivity from 500 to 1,500 pounds per acre.

E. Seral conditions:

Unknown.

F. Key indicators:

The presence of mountain silver sagebrush as the predominate and often the only shrub is the key indicator. No other type can be readily confused with this type.

G. Others who have described similar types:

None.

XI. Basin Big Sagebrush

Basin big sagebrush/cheatgrass
(*Artemisia tridentata* ssp. *tridentata*/*Bromus tectorum*)

A. Geology and land types:

Phase 1

This vegetation type was found on the Dry Alluvial land type of the Depositional land group immediately above the wet alluvial lands. It also occurs in pockets adjacent to streams in the Mountain and Hill slope land groups. The type was found in both Challis Volcanic and Sedimentary geologic materials.

Phase 2

Basin big sagebrush was also found as a type in pockets of more well developed soils on talus slopes in the Mountain land group.

B. Elevation and aspect:

Phase 1

This type is confined to elevations below 7,000 feet and usually occurs on relatively level terrain.

Phase 2

This phase of the type occurs almost exclusively on southerly exposed slopes. Due to the warmer microenvironment, the type may extend to as high as 7,800 feet.

C. Species composition:

Phase 1

All sites on which Basin big sagebrush was found were highly disturbed and subject to past and present heavy grazing. Therefore, the species composition contained many exotics, annuals and invaders depending on the intensity and duration of disturbance. However, the presence of Basin big sagebrush provided a good indicator of the extent of the community, but may mask the more subtle type differences within.

Species found on these sites include:

Artemisia tridentata ssp. *tridentata* - Basin big sagebrush
Agropyron trachycaulum - Slender wheatgrass
Bromus tectorum - Cheatgrass
Agropyron spicatum - Bluebunch wheatgrass

Stipa comata - Needle-and-thread
Lappula redowski - Annual stickseed
Lepidium spp. - Pepperweed
Descurainia spp. - Tansymustard
Amaranthus spp. - Amaranth
Chenopodium spp. - Pigweed
Chrysothamnus viscidiflorus - Douglas rabbitbrush
Chrysothamnus nauseosus - Rubber rabbitbrush
Verbascum thapsus - Flannel mullein
Taraxacum officinale - Common dandelion
Arabis spp. - Rockcress
Opuntia spp. - Cactus
Grindelia squarrosa - Curlcup gumweed

Phase 2

This second phase of the type is considerably drier. The most important species are:

Agropyron spicatum - Bluebunch wheatgrass
Oryzopsis hymenoides - Indian ricegrass
Bromus tectorum - Cheatgrass

D. Productivity:

Phase 1 - Production is usually from 500 to 1,500 pounds per acre.
Phase 2 - Production seldom exceeds 500 pounds per acre.

E. Seral conditions:

All stands observed were seral.

F. Key indicators:

The presence of Basin big sagebrush was the prime criteria used to define this type. None of the other types examines in this study have Basin big sagebrush present.

G. Others who have described similar types:

Winward (1970) described a Basin big sagebrush type in which needle-and-thread (Stipa commata) was the primary understory dominant.

XII. Wyoming Big Sagebrush

Wyoming big sagebrush/bluebunch wheatgrass
(*Artemisia tridentata* var. *wyomingensis*/*Agropyron spicatum*)

A. Geology and land types:

This type was found on soils derived from both Challis Volcanic and Sedimentary geologic materials. It is most prominent on Hillslope, and Mountain land groups, and Glacial Outwash land type of the Depositional land group. Soils which support this type are usually calcareous to or near the surface.

B. Elevation and aspect:

This type is restricted to elevations below 7,000 feet for the most part, but may occur on south slopes considerably higher. It occurs on all aspects but is more common on benches and south slopes in our area.

C. Species composition:

1. Species always present include:

Artemisia tridentata ssp. *wyomingensis* - Wyoming big sagebrush
Agropyron spicatum - Bluebunch wheatgrass
Oryzopsis hymenoides - Indian ricegrass
Sitanion hystrix - Bottlebrush squirreltail
Poa sandbergii - Sandberg bluegrass
Erigeron pumilis - Low fleabane
Phlox hoodii - Hood's phlox

2. Species usually present include:

Leptodactylon pungens - Prickly phlox
Stipa comata - Needle-and-thread
Arabis holboellii - Holboell rockcress
Chrysothamnus viscidiflorus - Douglas rabbitbrush

3. Species that may be present include:

Crepis acuminata - Tapertip hawksbeard
Phlox longifolia - Longleaf phlox
Tetradymia canescens - Gray horsebrush
Penstemon spp. - Beardtongue
Sisymbrium linifolium - Tumblemustard
Astragalus spp. - Locoweed
Bromus tectorum - Cheatgrass

D. Productivity:

Productivity varies rather widely in this type from 300 to 700 pounds per acre depending on condition of the type and the site.

E. Seral conditions:

Overgrazing tends to deplete the palatable forage species and increase the amount of annuals present. However, Wyoming big sagebrush does not tend to increase greatly under overgrazed conditions.

F. Key indicators:

The presence of Wyoming big sagebrush and the major subdominant bluebunch wheatgrass with Indian ricegrass are good species indicators of the type. Soils are usually calcareous to or near the surface.

This is the only type found on the area with Wyoming big sagebrush as the dominant shrub. Types with other subdominants are readily distinguished by species composition.

G. Others who have described similar types:

Winward (1970).

XIII. Mountain Big Sagebrush

Mountain big sagebrush/bluebunch wheatgrass
(Artemisia tridentata ssp. vaseyana/Agropyron spicatum)

A. Geology and land types:

This type was found on all three of the major geologic materials, but occurs more often on Challis Volcanics than any other. Land groups on which it is found include drier Depositional lands, Hillslope lands, Mountain lands and at a few locations, the lower elevation Glaciated lands as well.

B. Elevation and aspect:

The Mountain big sagebrush/bluebunch wheatgrass type is generally found between 6,000 feet and 7,800 feet on warm southerly exposures.

C. Species composition:

The most important difference between the Mountain big sagebrush/Idaho fescue and the Mountain big sagebrush/bluebunch wheatgrass is the general lack of Idaho fescue in the latter type. Many associated species are common to both except that those species more characteristic of warmer and drier climes tend to predominate in the wheatgrass type. Bitterbrush (Purshia tridentata) was generally present in most Mountain big sagebrush/bluebunch wheatgrass sites examined, but was only occasionally present in Mountain big sagebrush/Idaho fescue sites.

There is more bare ground and annuals in the Mountain big sagebrush/bluebunch wheatgrass than in the Mountain big sagebrush/Idaho fescue types:

1. Species always present include:

Artemisia tridentata ssp. vaseyana - Mountain big sagebrush
Agropyron spicatum - Bluebunch wheatgrass

2. Species usually present include:

Purshia tridentata - Bitterbrush
Poa sandbergii - Sandberg bluegrass
Eriogonum heracleoides - Wyeth eriogonum
Phlox longifolia - Longleaf phlox
Achillea millefolium - Western yarrow
Antennaria rosea - Rose pussytoes
Koeleria cristata - Prairie Junegrass
Chrysothamnus viscidiflorus - Douglas rabbitbrush
Chrysothamnus nauseosus - Rubber rabbitbrush
Symphoricarpos oreophilus - Mountain snowberry
Erigeron compositus - Fernleaf fleabane
Gayophytum nuttallii - Groundsmoke

Astragalus spp. - Locoweed
Arabis spp. - Rockcress
Erigeron spp. - Fleabane
Crepis acuminata - Tapertip hawksbeard

3. Species that may be present include:

Eriogonum umbellatum - Sulfur eriogonum
Viola spp. - Violet
Taraxacum officinale - Common dandelion
Trifolium spp. - Clover
Tetradymia canescens - Gray horsebrush
Bromus tectorum - Cheatgrass
Collinsia parviflora - Littleflower collinsia
Hackelia floribunda - Showy stickseed
Machareranthera canescens - Hoary aster
Castilleja spp. - Indian paintbrush
Gilia aggregata - Skyrocket gilia
Galium boreale - Northern bedstraw
Lappula redowski - Annual stickseed
Stipa columbiana - Subalpine needlegrass
Stipa lettermannii - Letterman needlegrass

D. Productivity:

Productivity of this type is quite variable depending on the site and conditions. Sites with as low as 300 pounds per acre and as great as 1,200 pounds per acre were found. Production averaged from 500 to 700 pounds per acre.

E. Seral conditions:

Sites badly overgrazed in this type are relatively common. Almost all that were examined retain the basic character of the type but bare ground increased greatly and the percent of total composition in annuals was high. Even on severely depleted sites remnant bluebunch wheatgrass plants can be found. The needlegrasses often are the prominent bunchgrasses on depleted sites.

F. Key indicators:

The presence of Mountain big sagebrush, the abundance of bluebunch wheatgrass, the general lack of Idaho fescue, and the southerly slope position are key indicators of the type. While bitterbrush is often abundant, other shrub species are present but not prominent. Elk sedge is normally not present.

The absence of Idaho fescue readily distinguishes the type from the Mountain big sagebrush/Idaho fescue type. The lack of elk sedge and the presence of relatively minor amounts of shrubs other than bitterbrush serve to distinguish the Mountain big sagebrush/bluebunch wheatgrass from the Subalpine big sagebrush-mountain brush/elk sedge type.

G. Others who have described the site:

Winward (1970).

Mountain big sagebrush/Idaho fescue
(Artemisia tridentata ssp. vaseyana/Festuca idahoensis)

A. Geology and land types:

This type is the most ubiquitous of the big sagebrush types in the area and occurs in one form or another on all geologies and land groups. It is uncommon on the Strongly Glaciated land except in the southernmost part of the area.

Two phases of the type are recognizable. The first is common on the Depositional land group; primarily on moraines, glacial outwash and terraces. The second phase is more common on the Hillslope, Mountain, Glaciated land groups.

B. Elevation and aspect:

The phase of the Mountain big sagebrush/Idaho fescue type associated with the Depostional land group occurs primarily on relatively flat terrace lands, but may be found on any aspect. It is found at elevations from 6,000 to approximately 7,500 feet.

The second phase of the type is more common on northerly aspects below 7,000 feet and southerly aspects up to and above 9,000 feet depending on the local conditions.

C. Species composition:

Phase one occurring primarily on the Depositional land group has few shrubs associated with big sagebrush. The second phase has a greater abundance of snowberry and forbs present.

1. Species always present include:

Artemisia tridentata ssp.vaseyana - Mountain big sagebrush
Festuca idahoensis - Idaho fescue

2. Species usually present include:

Eriogonum umbellatum - Sulfur eriogonum
Stipa columbiana - Subalpine needlegrass
Potentilla glandulosa - Gland cinquefoil
Poa sandbergii - Sandberg bluegrass
Phlox hoodii - Hood's phlox
Lupinus sericeus - Silky lupine
Antennaria rosea - Rose pussytoes
Koeleria cristata - Prairie Junegrass
Chrysothamnus viscidiflorus - Douglas rabbitbrush
Phlox longifolia - Longleaf phlox
Senecio integerrimus - Lambstongue groundsel
Achillea millefolium - Western yarrow
Agropyron spicatum - Bluebunch wheatgrass
Symphoricarpos oreophilus - Snowberry
Geum triflorum - Avens

3. Species that may be present include:

Tetradymia canescens - Gray horsebrush
Crepis acuminata - Tapertip hawksbeard
Viola purpurea - Goosefoot violet
Viola praemorsa - Violet
Arabis spp. - Rockcress
Eriogonum heracleoides - Wyeth eriogonum
Taraxacum officinale - Common dandelion
Mertensia oblongfolia - Oblong bluebell
Triflorum spp. - Clover
Sedum stenopetalum - Wormleaf stonecrop
Erigeron compositus - Fernleaf fleabane
Stipa lettermannii - Letterman needlegrass
Carex rossii - Ross sedge
Poa fendleriana - Mutton bluegrass
Gayophytum nuttallii - Groundsmoke
Leptodactylon pungens - Prickly phlox
Sitanion hystrix - Bottlebrush squirreltail
Purshia tridentata - Bitterbrush
Stipa columbiana - Subalpine needlegrass
Calochortus eurycarpus - Sego lily

D. Productivity:

The total production averaged from 500 to 700 pounds per acre, but may range to 1,500 pounds. Production on sites derived from sedimentary materials average 300 to 500 pounds more per acre than those derived from Challis Volcanic materials.

E. Seral conditions:

Mountain big sagebrush increases greatly with excessive grazing. Because of this increase, the understory associated species remain protected with a minor loss in canopy coverage. Annuals become abundant, however.

F. Key indicators:

The overstory of mountain big sagebrush with the understory dominance of Idaho fescue, and a relatively low proportion of bluebunch wheatgrass present are the prime indicators of this type.

At lower elevations the Mountain big sagebrush/bluebunch wheatgrass type grades into the Mountain big sagebrush/Idaho fescue on south slopes. These two types are distinguished based on the relative lack of Idaho fescue in the Mountain big sagebrush/bluebunch wheatgrass type.

At higher elevations the Mountain big sagebrush/Idaho fescue type grades into the Subalpine sagebrush-mountain brush/elk sedge type.

These two types are distinguished based on the great abundance of elk sedge and the presence of subalpine sagebrush in the latter type. Forbs are considerably more abundant in the former type. However, degradation of sites of the Subalpine sagebrush/mountain brush-elk sedge type have resulted in loss of elk sedge sod, and considerable soil loss. These sites now have an Idaho fescue dominated understory and result in a type physiognomy much like the Mountain big sagebrush/Idaho fescue and virtually indistinguishable from it. The major difference is the presence of subalpine sagebrush in these types.

G. Others who have described similar types:

Winward (1970).

Mountain big sagebrush/mountain brush
(Artemisia tridentata ssp. vaseyana/mountain brush)

A. Geology and land types:

This type occurs more commonly on Sedimentary and Granitic geologic materials and is generally associated with the Mountain land group but may also occur at lower elevations in the Glaciated land group.

B. Elevation and aspect:

This type seldom is found above 8,000 feet and usually occurs from 6,000 to 7,800 feet on southerly aspects.

C. Species composition :

There are two phases of this type found on the area. One is closely associated with Granitic geology, does not normally have much Great Basin wildrye associated with it. The second occurs primarily on Sedimentary geologies or in a few limited mesic pockets in Challis Volcanic geologies and has Great Basin wildrye as a major constituent of the type.

The species composition is one of the most diverse of any type found on the area. The number of species observed per site often exceeds forty.

1. Species always found include:

Artemisia tridentata ssp. vaseyana - Mountain big sagebrush
Agropyron spicatum - Bluebunch wheatgrass
Purshia tridentata - Bitterbrush
Symphoricarpos oreophilus - Western snowberry
Prunus virginiana - Common chokecherry

2. Species that usually are present include:

Elymus cinereus - Great Basin wildrye
Bromus marginatus - Big mountain brome
Chrysothamnus viscidiflorus - Douglas rabbitbrush
Amelanchier alnifolia - Serviceberry
Ribes cereum - Wax currant
Agropyron trachycaulum - Slender wheatgrass
Melica bulbosa - Oniongrass
Hydrophyllum capitatum - Ballhead waterleaf
Poa sandbergii - Sandberg bluegrass
Eriogonum umbellatum - Sulfur eriogonum
Crepis acuminata - Taper tip hawksbeard
Balsamorhiza sagittata - Balsamroot
Arabis holboellii - Holboell rockcress
Collinsia parviflora - Littleflower collinsia
Agastache urticifolia - Nettleleaf giant hyssop
Hackelia floribunda - Showy stickseed
Eriogonum heracleoides - Wyeth eriogonum

3. Species that may be found include:

Populus tremuloides - Aspen
Osmorhiza occidentalis - Sweet anise
Chrysothamnus nauseosus - Rubber rabbitbrush
Ceanothus velutinus - Snowbush ceanothus
Rosa woodsii - Woods rose
Geranium viscosissimum - Sticky geranium
Festuca idahoensis - Idaho fescue
Bromus tectorum - Cheatgrass
Poa canbyi - Canby bluegrass
Poa fendleriana - Mutton bluegrass
Poa ampla - Big bluegrass
Hieracium albertinum - Hawkweed
Gilia aggregata - Skyrocket gilia
Phacelia hastata - Alpine phacelia
Lupinus sericeus - Silky lupine
Senecio integerrimum - Lambstongue groundsel
Delphinium spp. - Larkspur

D. Productivity:

The Mountain big sagebrush/mountain brush type is the most productive of the sagebrush types. Production averages 1,000 pounds per acre but often exceeds that figure. Sites with estimated production as high as 4,000 pounds per acre have been found.

E. Seral condition:

A number of sites of this habitat type were examined that had been subjected to heavy grazing pressure by sheep over a long period of years. Because this type is characteristic of steep south slopes, soil movement and soil loss plays an important part in the degradation of the community. Bitterbrush and chokecherry are two of the important species that are reduced in cover with oniongrass and big mountain brome two of the prime increasers. The perennial forb component becomes severely depleted with a number of the most palatable species lost from the community. Bare ground and the component of annuals and biennials increases greatly with Collinsia, stickseed, cheatgrass, bedstraw, thistle, tansymustard and groundsmoke some of the major species.

It is suspected that the ultimate degradation results in a loss of the upper soil horizons and an ultimate condition with bluebunch wheatgrass, oniongrass, carrotleaf leptotaenia (Lomatium dissectum) and annuals, as the major species associates.

F. Key indicators:

The wide variety of shrub species, particularly the presence of chokecherry, the fact that well over half of the total

production is by shrubs and the great variety of forb species are key indicators of the type. In our area the type is always found on steep southerly exposed sites.

In seral stands, particularly those that have suffered from considerable soil loss, the type is more difficult to define. Such sites usually should be classed as different types due to the remote likelihood of their progressing back up the successional scale without a new soil mantle being formed.

There is some gradation between the Mountain big sagebrush/mountain brush type and the Mountain big sagebrush/bluebunch wheatgrass types. Both will occur on southerly exposures, but the latter type is more characteristic of soils derived from volcanic materials, and the Mountain big sagebrush/mountain brush type more common on soils derived from sedimentary or granitic materials. The latter type is more mesic and found on sites with relatively well developed soils with subsurface moisture recharge.

G. Others who have described similar types:

Lewis and Riegelhuth (1964).

XIV. Subalpine Big Sagebrush

Subalpine big sagebrush/big mountain brome-Idaho fescue (Artemisia tridentata ssp. vaseyana form spiciformis/Bromus marginatus-Festuca idahoensis)

A. Geology and land types:

This type is usually found on geologic material of mixed parentage but may be found on all three geologic types. It tends to be closely associated with the Depositional land group, and bottom or streamside positions in the Glaciated and Mountain land groups.

B. Elevation and aspect:

The type is found from 7,000 to 9,000 feet on all aspects but is usually in a stream bottom or relatively flat position.

C. Seral conditions:

When the type occurs on streamside terraces, ground moraines, or glacial outwash lands, it is subject to invasion by lodgepole pine. Often the type is found with a sparse open canopy of lodgepole, but it tends to retain its character and the lodgepole pine normally dominates ecotonal sites only. However, this type is closely related to the Lodgepole pine/Idaho fescue type and is at times difficult to distinguish from it, particularly in ecotonal situations.

1. Species always found include:

Artemisia tridentata ssp. vaseyana form spiciformis - Subalpine sagebrush
Festuca idahoensis - Idaho fescue
Bromus marginatus - Big mountain brome

2. Species usually present include:

Agastache urticifolia - Nettleleaf giant hyssop
Symphoricarpos oreophilus - Mountain snowberry
Agropyron trachycaulum - Slender wheatgrass
Stipa columbiana - Subalpine needlegrass
Achillea millefolium - Western yarrow
Taraxacum officinale - Common dandelion
Lupinus spp. - Lupine
Antennaria rosea - Rose pussytoes
Poa spp. - Bluegrass

3. Species that may be present include:

Geum triflorum - Prairie smoke
Astragalus spp. - Locoweed
Senecio integerrimus - Lambstongue groundsel
Calochortus eurycarpus - Sego lily
Erigeron spp. - Fleabane
Eriogonum spp. - Eriogonum

D. Productivity:

Productivity is variable but it generally averages 300 to 500 pounds per acre.

E. Seral conditions:

Unknown

F. Key indicators:

This type may be distinguished by the presence of the three major species - subalpine sagebrush, Idaho fescue, and Big mountain brome. The type occurs on Depositional lands with coarse gravelly soils, but it was also found on ground moraines and Valley Train lands.

With lodgepole pine invasion it may become difficult to distinguish between the Lodgepole pine/Idaho fescue type and the Subalpine sagebrush/big mountain brome-Idaho fescue type, especially in ecotonal situations. Usually the presence of subalpine sagebrush and big mountain brome are good indicators.

G. Others who have described similar types:

Winward (1970).

Subalpine big sagebrush/Idaho fescue
(Artemisia tridentata ssp. vaseyana form spiciformis/Festuca idahoensis)

A. Geology and land types:

This type is closely associated with the Strongly Glaciated land group but may also be found in the higher elevation portions of the Granitic Glaciated and Glaciated land groups. It is found on all three geologic materials, but was found more often on granitic and sedimentary materials.

B. Elevation and aspect:

All sites examined were above 8,000 feet, and most were above 9,000 feet in elevation. The type was found on all aspects.

C. Species composition:

Species usually found include:

Artemisia tridentata ssp. vaseyana form spiciformis - Subalpine sagebrush
Festuca idahoensis - Idaho fescue
Sitanion hystrix - Bottlebrush squirreltail
Stipa lettermani - Letterman needlegrass
Stipa columbiana - Subalpine needlegrass
Lupinus sericeus - Silky lupine
Solidago multiradiata - Low goldenrod
Haplopappus suffruticosus - Singlehead goldenweed
Phlox hoodii - Hood's phlox
Antennaria rosea - Rose pussytoes
Penstemon humilis - Low penstemon
Geum triflorum - Avens
Hieracium albertinum - Hawkweed

D. Productivity:

This type produces from 300 to 700 pounds per acre.

E. Seral conditions:

At higher elevations, usually above 9,000 feet, this type may grade into an almost pure alpine fescue grassland with either Idaho fescue or sheep fescue as the major dominant with little or no subalpine sagebrush present. In intermediate conditions subalpine sagebrush and singlehead goldenweed (Haplopappus suffruticosus) form the shrub overstory. With further site changes, singlehead goldenweed is the only shrub dominant with Idaho fescue as the understory. Finally, the latter condition grades into the pure fescue grass type. On very thin coarse soils the sandwort (Arenaria aculeata) dominated cushion plant community can be found adjacent to the fescue type. While these plant communities may be the result of retrogressive

degradation of the Subalpine big sagebrush/Idaho fescue type, justifiable questions may be raised as to whether the Subalpine big sagebrush/Idaho fescue type ever existed on the sandwort-cushion plant or fescue dominated sites. Certainly without a deposition of a new soil mantle or a long period of soil development, such communities will never progress to the Subalpine big sagebrush/Idaho fescue type. Another consideration is that the fescue sites dominated by sheep fescue (Festuca ovina) are undoubtedly a unique type. Sheep fescue is but rarely found in the Subalpine big sagebrush/Idaho fescue type. Fescue sites dominated by Idaho fescue are apparently more closely related to the Subalpine big sagebrush/Idaho fescue type.

F. Key indicators:

The presence of subalpine big sagebrush associated with Idaho fescue but without big mountain brome and nettleleaf giant hyssop, and the great variety of forbs are good indicators of the Subalpine sagebrush/Idaho fescue type. But intergrading conditions with surrounding vegetation types are common, making difficult the definition of these ecotones.

G. Others who have described similar types:

None.

Subalpine big sagebrush-mountain brush/elk sedge (Artemisia tridentata ssp. vaseyana form spiciformis-mountain brush/Carex geyeri

A. Geology and land types:

This type is found on all three major geologic materials but is most often found on Challis Volcanic material. It is closely associated with the Mountain and Glaciated land groups.

B. Elevation and aspect:

The type was found in an elevational range from 7,000 to 9,500 feet on southerly exposures.

C. Species composition:

1. Species always found include:

Artemisia tridentata ssp. vaseyana form spiciformis - Subalpine sagebrush
Carex geyeri - Elk sedge

2. Species usually found include:

Symphoricarpos oreophilus - Mountain snowberry
Ribes cereum - Wax currant
Festuca idahoensis - Idaho fescue
Sitanion hystrix - Bottlebrush squirreltail
Eriogonum heracleoides - Wyeth eriogonum
Poa nervosa - Wheeler bluegrass
Haplopappus suffruticosus - Singlehead goldenweed
Ribes montigenum - Gooseberry currant

3. Species that may be present include:

Solidago multiradiata - Low goldenrod
Lupinus sericeus - Silky lupine
Abies lasiocarpa - Subalpine fir
Pinus albicaulis - Whitebark pine
Stipa columbiana - Subalpine needlegrass
Poa sandbergii - Sandberg bluegrass
Agropyron spicatum - Bluebunch wheatgrass
Achillea millefolium - Western yarrow
Oryzopsis exigua - Little ricegrass
Antennaria rosea - Rose pussytoes

D. Productivity:

Production on this type is about equally distributed between shrubs and other species. Total production averages from 500 to 700 pounds per acre.

E. Seral conditions:

Heavy sheep grazing apparently results in a breaking up of the elk sedge sod and some soil loss. The Subalpine sagebrush-mountain brush/elk sedge type understory becomes dominated by Idaho fescue and ultimately by needlegrass and bromes. This sequence in type degradation requires additional documentation and verification. Usually the subalpine sagebrush remains as a dominant cover and remnant elk sedge plants may be found.

F. Key indicators:

The type usually may be distinguished by the presence of subalpine sagebrush, with several associated shrubs and an elk sedge dominated understory. However, distinguishing the type in seral condition from the Mountain big sagebrush/Idaho fescue is at times difficult, particularly when the characteristics of the subalpine sagebrush are not as well developed. The Subalpine sagebrush-mountain brush/elk sedge grades with the Subalpine fir/elk sedge in some places. At times the ecotones are broad and difficult to categorize.

G. Others who have described similar types:

None.

XV. Grasslands

Bluebunch wheatgrass/oniongrass (Agropyron spicatum/Melica bulbosa)

A. Geology and land types:

This type occurred on two geologic materials - Wood River Sediments and Granitics - although it was found more often on the sedimentaries. It was found on both the Mountain lands and the Glaciated lands. Soils are shallow and rocky.

B. Elevation and aspect:

The type occurs from 6,000 to 8,000 feet in elevation on south or southwesterly aspects. It always occurs on steep slopes, usually 50 to 75 percent.

C. Species composition:

This type is virtually shrub free, although scattered individuals of snowberry (Symphoricarpos oreophilus), mountain big sagebrush (Artemisia tridentata ssp. vaseyana), or wax currant (Ribes cereum) may occasionally be found.

Bluebunch wheatgrass (Agropyron spicatum) is the main grass dominant with oniongrass (Melica bulbosa) as a subdominant and occasionally may become codominant. On one site examined, carrotleaf lomatium (Lomatium dissectum) was the only other prominent perennial present on the site. Usually, however, balsamroot (Balsamorhiza sagittata), sulfur eriogonum (Eriogonum umbellatum), and Viola spp. are present as well. Annuals and biennials are prominent in the type including Descurainia spp. Cirsium vulgare, Linanthus sp., Bromus tectorum, etc.

D. Productivity:

Production of the sites examined generally averaged 300 to 400 pounds per acre.

E. Seral conditions:

It is suspected that this type is a degraded condition of the Mountain big sagebrush/mountain brush type. A number of sites were examined which showed a series of conditions between the two types. Because the species composition changes that were observed were accompanied by a loss of soil on the steep slopes, the Bluebunch wheatgrass/oniongrass type represents a new type which cannot progress back to the Mountain big sagebrush/mountain brush type again without a new soil mantle being developed. There is some question, however, on some sites if a more well developed soil ever covered the site.

F. Key indicators:

The basic indicators of this type are steep southerly facing slopes with shallow rocky soils. Shrubs are conspicuously absent and the main dominant is Agropyron spicatum (bluebunch wheatgrass) with Melica bulbosa (oniongrass) as a subdominant.

On south slopes no other type in the area has the shrub free condition of the Bluebunch wheatgrass/oniongrass type. However, sites intermediate between the Mountain big sagebrush/mountain brush type and the Bluebunch wheatgrass/oniongrass type are common, particularly in the vicinity of sheep driveways and other areas of historical sheep concentration.

G. Others who have described similar types:

Mueggler and Harris (1969).

Alpine fescue (Festuca ovina-Festuca idahoensis)

A. Geology and land types:

This type is restricted to the Strongly Glaciated land group and is usually associated with Cirque Basin, Scoured Cirque Basin and High Elevation Upland types. It may be found on all three geologic materials, but occurred more commonly on Granitic and Sedimentary materials.

B. Elevation and aspect:

All sites examined were above 8,000 feet and most were above 9,000 feet in elevation. The type was found on all aspects.

C. Species composition:

This vegetation type is virtually shrub free. Idaho fescue (Festuca idahoensis) is the dominant species on most sites, although some sites were dominated by sheep fescue (Festuca ovina). For convenience, the two have been combined although they undoubtedly represent separate communities. Species that have been found associated with the fescues include:

Lupinus sericeus - Silky lupine
Sitanion hystrix - Bottlebrush squirreltail
Trisetum spicatum - Spike trisetum
Poa spp. - Bluegrass
Stipa lettermani - Letterman needlegrass
Carex geyeri - Elk sedge
Carex spp. - Sedges

D. Productivity:

Total production on this type varies from 200 to 400 pounds per acre.

E. Seral conditions:

Some sites are dominated by sheep fescue and these probably represent a unique type. Those dominated by Idaho fescue are perhaps seral stands of the Subalpine big sagebrush/Idaho fescue sites, although they now have unique environmental conditions and must be considered a separate type.

F. Key indicators:

The type is easily identified by the high elevation location and the dominance by fescue. However, sites dominated by fescue integrade with the Subalpine sagebrush/Idaho fescue type. This grading of types makes it difficult to distinguish between the two in ecotonal situations.

G. Others who have described similar types:

U.S. Forest Service Range Environmental Analysis Handbook (R-6).

XVI. Alpine Types

Cushion plant (Arenaria aculeata)

A. Geology and land types:

This type was found on the Strongly Glaciated, Granitic Glaciated, and Glaciated land groups. It is found on all three geologic materials, but it is more common on Granitic and Sedimentary geologic materials. The type is characteristic of ridgetops, Scoured Cirque Basin land, High Elevation Upland, and Upland land types, but also occurs in small pockets throughout the Strongly Glaciated and Glaciated land groups on other land types as well.

B. Elevation and aspect:

The type is confined to elevations above 8,000 feet and occurs on all aspects.

C. Species composition:

This type is variable in species composition, and the following species may be present:

Arenaria aculeata - Sandwort
Stipa occidentalis - Western needlegrass
Lupinus holosericeus - Lupine
Eriogonum ovalifolium - Cushion eriogonum
Penstemon attenuatus - Sulphur penstemon
Haplopappus suffruticosus - Singlehead goldenweed
Antennaria rosea - Rose pussytoes
Erigeron compositus - Fernleaf fleabane
Stipa lettermani - Letterman needlegrass
Haplopappus acaulis - Stemless goldenweed
Sitanion hystrix - Bottlebrush squirreltail
Festuca idahoensis - Idaho fescue

While any or all of the above mentioned species may be present, sandwort and lupine are usually most conspicuous on the site. Plant coverage is usually sparse, with seldom more than 25 to 35 percent of the ground covered.

D. Productivity:

Vegetation production on this type is very low and seldom exceeds 200 pounds per acre.

E. Seral condition:

The cushion plant community dominated by sandwort may be a seral condition of the higher elevation Subalpine big sagebrush/

Idaho fescue type. There is some question, however, if the sites now dominated by the sandwort ever had any other vegetation community on them. In almost all cases the sandwort cushion plant community occurs on harsh sites with little soil development and little likelihood that a soil capable of supporting any higher forms of vegetation ever existed on such sites so recently reclaimed from domination by glaciers.

F. Key indicators:

The type occurs exclusively at higher elevations on gravelly soils with sandwort as the major perennial dominant.

This type integrades with the Ivesia dominated cushion plant type, the Whitebark pine/barren type, and seral stands of the Subalpine big sagebrush/Idaho fescue types. It may be separated from the Ivesia cushion plant type by the general absence of Ivesia, pulvinate phlox, alpine forget-me-not and other species more characteristic of the rather lush Ivesia-cushion plant type.

It is difficult to separate the sandwort cushion plant type from seral conditions of the Subalpine big sagebrush/Idaho fescue type if indeed a difference actually exists.

G. Others who have described similar types:

None.

Cushion plant (Ivesia gordonii)

A. Geology and land types:

This type develops on all three geologic materials on the Strongly Glaciated, Granitic Glaciated, and Glaciated land groups. It is particularly characteristic of ridgetops in the Scoured Cirque Basin land, High Elevation Upland, and throughout the Strongly Glaciated and Glaciated land groups on other land types as well.

B. Elevation and aspect:

The type is confined to elevations above 8,000 feet and occurs on all aspects.

C. Species composition:

The species composition varies considerably from place to place in this type, but the following species are usually present:

Ivesia gordonii - Gordon ivesia
Phlox pulvinata - Phlox
Eriogonum ovalifolium - Cushion eriogonum
Erigeron compositus - Fernleaf fleabane
Geum rossii - Ross avens
Oxytropis campestris - Plains crazyweed
Erytrichium nanum - Alpine forget-me-not
Poa epilis - Skyline bluegrass
Carex spp. - Sedges
Astragalus alpinus - Alpine milkvetch
Festuca ovina - Sheep fescue
Selaginella sp. - Spike moss
Trisetum spicatum - Spike trisetum
Polemonium viscosum - Sticky polemonium
Antennaria spp. - Pussytoes
Lesquerella alpina - Bladderpod
Senecio canus - Woolly groundsel
Phlox alyssifolia - Phlox
Arenaria obtusiloba - Sandwort
Saxifraga occidentalis - Alberta saxifrage
Poa rupicola - Timber line bluegrass
Sitanion hystrix - Bottlebrush squirreltail
Agoseris glauca - Pale agoseris

D. Productivity:

Production on the Ivesia-cushion plant type is higher than on the sandwort-cushion plant type, usually varying from 150 to 300 pounds per acre.

E. Seral conditions:

This plant community may be seral to a sedge mat type dominated by Carex elynoides. This sedge type seems to be associated with

sites with a fine textured surface soil horizon. This soil may be the result of windblown soil and debris collected by the sedge mat or developed in place. Exactly under what conditions the sedge mat develops is unknown. Carex elynoides mats were observed intermingled in mosaic fashion with the Ivesia cushion plant type and mats of Geum rossii (Ross avens). Lewis (1970) suggested that such communities are stages in primary alpine succession in the Uinta Mountains leading to sedge dominated stands.

F. Key indicators:

This type is considerably more diverse and lush than the sandwort-cushion plant type. Ivesia gordonii is a major dominant usually associated with Phlox pulvinata. Arenaria aculeata sandwort is usually not present although other species of sandwort often are present.

This type is seldom confused with other types except in cases where seral conditions exist that might be confused with the sandwort-cushion plant type.

G. Others who have described similar types:

None.

Alpine dryland types (Juncus drummondii and Carex tolmiei)

A. Geology and land types:

Both vegetation types are found on the Strongly Glaciated, Granitic Glaciated and Glaciated land groups. They were found primarily on Granitic soils.

B. Elevation and aspect:

Both types are found above 8,000 feet on all aspects.

C. Species composition:

1. Carex tolmiei type

Carex tolmiei - Tolmie sedge
Carex pyrenaica - Pyrenian sedge
Carex straminiformis - Sedge
Juncus parryi - Parry rush
Veronica cusickii - Cusick speedwell
Castilleja sp. - Indian paintbrush
Erigeron tweedyi - Fleabane
Sibbaldia procumbens -
Antennaria sp. - Pussytoes

2. Juncus drummondii type

Juncus drummondii - Drummond rush
Antennaria sp. Pussytoes
Carex tolmiei - Tolmie sedge
Polygonum bistortoides - American bistort
Castilleja cusickii - Yellow paintbrush
Erigonum sp. ▲ Eriogonum
Penstemon globosa - Penstemon
Sibbaldia procumbens -
Senecio crassulus - Thickleaf groundsel
Potentilla sp. - Cinquefoil

D. Productivity:

Unknown.

E. Seral conditions:

Unknown.

F. Key indicators:

The characteristic species are key indicators of the types.

G. Others who have described similar types:

These two types were described by Lewis and Riegelhuth (1964).

Rocky slope - Boulderfield

A. Geology and land types:

This type develops on all geologic materials found in the area but occurs only in the Strongly Glaciated, Granitic Glaciated, and Glaciated land groups.

B. Elevation and aspect:

The type occurs above 8,000 feet in elevation, on all aspects.

C. Species composition:

The species found in this community are hardy plants adapted to severe conditions at high elevations, and are capable of growing with a minimum of soil rooting material. Some of the species found include:

Hulsea algida -
Oxyria digyna - Alpine mountain sorrel
Potentilla diversifolia - Varileaf cinquefoil
Carex tolmiei - Tolmie sedge
Carex pelocarpa - Sedge
Sitanion hystrix - Bottlebrush squirreltail

In addition to the above listed species, plants characteristic of the cushion plant and Sibbaldia/Cassiope communities are found in suitable pockets throughout.

D. Productivity:

The production per acre of this type is extremely low and seldom exceeds 50 pounds.

E. Seral conditions:

Unknown.

F. Key indicators:

The rocky conditions, characteristic species and low plant cover are key indicators of the type.

G. Others who have described similar types:

This type was described by Lewis and Riegelhuth (1964).

Sibbaldia/Cassiope

A. Geology and land types:

This type occurs on Strongly Glaciated land on all three of the major geologic materials in the area. It is characteristic of seeps and freshets particularly in Cirque Basin and Scoured Cirque Basin lands.

B. Elevation and aspect:

The type is found at elevations above 8,000 feet on all aspects.

C. Species composition:

This type has species in common with adjacent meadows, cushion plant and rock types. The following are most common:

Sibbaldia procumbens -
Cassiope mertensiana - Mertens cassiope
Luzula parviflora - Millet woodrush
Hulsea algida -
Carex pyrenaica - Sedge
Juncus parryi - Parry rush
Trisetum spicatum - Spike trisetum
Arnica latifolia - Broadleaf arnica
Chionophila tweedyi - Snowlover
Anemone globosa - Pacific anemone
Senecio fremontii - Groundsel
Solidago multiradiata - Low goldenrod
Penstemon ellipticus - Rockvine penstemon
Gaultheria humifusa - Western wintergreen
Arnica longifolia - Longleaf arnica
Phylodoce empetriformis - Red mountainheath
Kalmia polifolia - Mountain laurel

D. Productivity:

Production on this type seldom exceeds 200 pounds per acre.

E. Seral conditions:

Unknown.

F. Key indicators:

Because of the location at seeps and freshets and the characteristic species, the type is seldom confused with any other.

G. Others who have described similar types:

This type was described by Lewis and Riegelhuth (1964).

XVII. Meadow Communities

Low to mid elevation

A. Geology and land types:

These vegetation types occur on the Wet Alluvial and Valley Train lands of the Sawtooth Moraine and the Depositional land groups. Geologic material is usually of mixed origin.

B. Elevation and aspect:

All of these meadow types are found below 8,500 feet in elevation on wet bottoms.

C. Species composition:

1. Beaked sedge (Carex rostrata) type

"The area occupied by this community is rather limited. Carex rostrata (beaked sedge) grows in very wet sites. It may extend into open water to a depth of 16 inches. It also occurs in shallow potholes where there is standing water through the early part of the summer season. This species grows in nearly pure stands." (Lewis and Riegelhuth, 1964).

2. Willow/watersedge type (Salix spp./Carex aquatilis). Several species of willow (Salix spp.) tend to dominate most sites but some areas are relatively open with water sedge (Carex aquatilis) as the major dominant. This type grows on sites with a high water table but considerably drier than the beaked sedge type. Associated with these major dominants are:

Hordeum brachyantherum - Meadow barley
Deschampsia caespitosa - Tufted hairgrass
Carex illota - Sheep sedge
Gentiana calycosa - Ranier pleated gentian
Pedicularis groenlandica - Elephanthead lousewort
Vaccinium spp. - Huckleberry
Carex spp. - Sedge
Potentilla fruticosa - Bush cinquefoil
Potentilla glandulosa - Gland cinquefoil
Erigeron spp. - Fleabane daisy

Many of these meadow sites are badly overgrazed and currently dominated by such species as:

Muhlenbergia richardsonis - Mat muhly
Triflorum spp. - Clover
Antennaria sp. - Pussytoes
Achillea millefolium - Western yarrow
Potentilla fruticosa - Bush cinquefoil and others

On the eastern half of the area Salix bebbiana (Bebb willow) is the primary willow dominant, but a number of other species

may be present particularly on the western half of the area. This vegetation type is highly productive with annual production often exceeding 2,000 pounds per acre.

3. Tufted hairgrass (Deschampsia caespitosa) type

Most of the area that would be occupied by this type has been altered by heavy grazing and only remnants can be found. In addition to tufted hairgrass, species that are commonly found are:

Trifolium spp. - Clover
Muhlenbergia richardsonis - Mat muhly
Castilleja cusickii - Yellow paintbrush
Carex praegracilis - Sedge
Cirsium foliosum - Elk thistle
Agrostis scabra - Bentgrass
Geum triflorum - Avens
Erigeron spp. - Fleabane daisy
Carex spp. - Sedge

4. Mid elevation meadow complex

"Concentric zones radiate out from a central bog, each with their characteristic species. The central bog is occupied by Eleocharis acicularis (Needle spikerush). The bulk of the meadow which has highly saturated soils, but not a bog have Carex miserabilis (sedge) as the dominant species. Carex ablata (sedge) is the dominant species on the damp meadow edge. These three species make up over 90 percent of the total vegetation." (Lewis and Riegelhuth, 1964).

Other species associated in the complex are:

Calamagrostis canadensis - Bluejoint reedgrass
Juncus longistylis - Rush
Deschampsia caespitosa - Tufted hairgrass
Arnica longifolia - Longleaf arnica
Mimulus primuloides - Primrose monkeyflower
Erigeron perigrinus - Fleabane daisy
Aconitum columbianum - Columbia monkshood
Polygonum bistortoides - American bistort
Castilleja rhexifolia - Splitleaf paintedcup
Veronica wormskjoldii - Wormskjold speedwell
Habenaria dilatata - White bog orchid

D. Others who have described similar types:

These types were described by Lewis and Riegelhuth, (1964).

Meadow communities - High elevation

A. Geology and land types:

These vegetation types occur on the Valley Train lands of the Sawtooth Moraine and Depositional land groups, and in Cirque Basin and Scoured Cirque Basin lands in the Strongly Glaciated land groups. Geologic material is usually of mixed origin.

B. Elevation and aspect:

These vegetation types are found from 8,000 to 10,000 feet in elevation on wet bottoms.

C. Species composition:

1. Black alpine sedge/alpine bentgrass (Carex nigricans-Agrostis humilis). The alpine bentgrass is most common in the wettest parts of the meadows with black alpine sedge dominating the main portion of the meadow. Species found include:

Carex nigricans - Black alpine sedge
Agrostis humilis - Alpine bentgrass
Juncus parryi - Parry rush
Deschampsia atropurpurea - Mountain hair grass
Ligusticum filicinum var. tenuifolium - Ligusticum
Potentilla sp. - Cinquefoil
Luzula parviflora - Millet woodrush
Senecio subnudus - Groundsel
Senecio lugens - Groundsel
Veronica wormskjoldii - Wormskjold speedwell
Polygonum bistortoides - American bistort

Throughout the Black alpine sedge-alpine bentgrass type the Red mountainheath/western ledum type may be found on low hummocks. These two types form a mosaic in many mountain meadows.

2. Red mountainheath/western ledum (Phyllodoce empetriformis-ledum glandulosum). The species composition in this type is intermediate between the Black alpine sedge/alpine bentgrass and the Subalpine fir-Engelmann spruce/western ledum types. Important species include:

Phyllodoce empetriformis - Red mountainheath
Ledum glandulosum - Western ledum
Salix spp. - Willow
Carex nigricans - Black alpine sedge
Agrostis humilis - Alpine bentgrass
Pedicularis groenlandica - Elephanthead lousewort
Mimulus lewisii - Lewis monkeyflower
Cassiope mertensiana - Mertens cassiope
Carex spp. - Sedge

3. Alpine willow - A number of species of willow may be found in these high elevation meadow sites including:

Salix arctica - Arctic willow
Salix tweedyi - Tweedy's willow
Salix wolfii - Wolf's willow
Salix mackensiana - Willow
Salix spp. - Willow

The identification of the above species is tentative. These willow species form low growing dense stands with an average height of two feet, but in some locales taller species predominate up to five feet tall. The associated species are largely sedges and many of the species found in the adjacent Black alpine sedge/alpine bentgrass and the Red mountainheath/western ledum types.

D. Productivity:

Vegetation production varies from 500 to 1,000 pounds per acre in most sites examined but may be somewhat higher on more favorable soils.

E. Seral conditions:

Unknown.

F. Others who have described similar types:

The Black alpine sedge/alpine bentgrass was described by Lewis and Riegelhuth (1964). Other types were not described previously.

KEY TO THE PLANT COMMUNITIES FOUND ON THE SAWTOOTH, WHITE CLOUD, BOULDER AND PIONEER MOUNTAINS

KEY NO. 1 - Key to the plant communities found on the Sawtooth, White Cloud, Boulder and Pioneer Mountains

I. Site tree dominated (or formerly tree dominated) — Section A

I. Site shrub, grass, grasslike, or forb dominated — II

II. Site shrub dominated or formerly shrub dominated — Section B

II. Site grass, grasslike, or forb dominated — III

III. Site dominated by grass or grasslike plants — Section C

III. Site dominated by forbs — Section D

* * * * * * *

Section A. Site tree dominated (or formerly tree dominated)

1. Dominant trees coniferous — 2

2. Ponderosa pine dominant in overstory — 3

3. Understory dominated by bunchgrasses (Bluebunch wheatgrass and Idaho fescue)
Ponderosa pine/bluebunch wheatgrass

3. Understory dominated by pinegrass (Douglas fir reproduction present in the understory)
Douglas fir/pinegrass

2. Other coniferous trees dominate the overstory — 4

4. Douglas fir dominant in overstory — 5

5. Understory with a few shrubs, has a grassy park-like appearance, dominant grass is pinegrass.
Douglas fir/pinegrass

5. Understory shrubby, or with a mixture of shrubs, forbs, grasses and grasslike plants. Pinegrass is usually absent or is a minor component in the understory. — 6

6. Understory is open and shrubby. Snowberry is the dominant shrub. Only scattered elk sedge plants are present. (North and east slopes)
Douglas fir/snowberry

6. Understory rather densely shrubby, or a mixture of shrubs, forbs, grasses, and grasslike plants occupy the site rather fully. 7

7. Understory with snowberry the most abundant shrub. Few other shrubs present. Elk sedge is the primary ground cover. (South and west slopes).
Douglas fir/elk sedge-snowberry

7. Understory rather densely shrubby. Shrub species other than snowberry abundant. Herbaceous layer dominated by forbs. Elk sedge, if present, is a minor species.
Douglas fir/tall shrubs

4. Conifers other than ponderosa pine or Douglas fir dominant in the overstory. 8

8. Subalpine fir and engelmann spruce either singly or in combination dominate the site. 9

9. Understory dominated by grouse whortleberry.
Subalpine fir/grouse whortleberry

9. Grouse whortleberry absent or present as a minor component of the understory. 10

10. Elk sedge is conspicuous in the understory. Shrubs are a minor component. Forbs, particularly the lupines, may be abundant. Understory has a grassy look with bare spaces conspicuous.
Subalpine fir/elk sedge

10. Elk sedge, if present, is a minor component in the understory. Understory may be dominated by shrubs and forbs; a dense cover of grasses with few bare spaces; or a dense cover of forbs. 11

11. Understory dominated by a dense cover of bluejoint reedgrass with few bare spaces. Shrubs may be present, but they do not detract from the grassy look of the understory.
Engelmann spruce-subalpine fir/bluejoint reedgrass

11. Understory has a shrubby look with grasses and grasslike plants not prominent; or a dense understory of forbs. 12

12. Dry hillside sites (usually on north to east slopes). Understory is open and shrubby. Snowberry is the dominant shrub, with a few forbs, grasses and grasslike plants also present.
Subalpine fir/snowberry

12. Moist streamside sites. Either a dense cover of shrubs or a dense cover of forbs dominate in the understory. 13

13. Understory shrub dominated. Western ledum is the most abundant shrub. Subalpine fir-engelmann spruce/western ledum

13. Understory forb dominated with only a minor component of shrubs. Engelmann spruce-subalpine fir/tall forb

8. Lodgepole pine or whitebark pine dominate the overstory on the site. 14

14. Lodgepole pine alone or with a minor amount of other tree species is the dominant tree. 15

15. Idaho fescue is the dominant understory species. Little if any elk sedge is present. Subalpine big sagebrush, Mountain big sagebrush or Thermopola low sagebrush may be present. Site is on dry gravelly glacial outwash, river terraces or moraines. No other coniferous tree present.
Lodgepole pine/Idaho fescue

15. Understory various, but not with the above combination of characteristics. Search site for other coniferous trees reproducing on the site. Return to No. 4 in the key and follow through as though the site were currently dominated by the reproducing coniferous tree. 4

14. Whitebark pine alone or with a minor amount of lodgepole pine and/or subalpine fir is the dominant tree on the site. 16

16. Whitebark pine is the primary tree on the site. Tree canopy averages 10 percent or less. Understory is variable. In some cases elk sedge is prominent, in others sandwort and still others lupines. Whitebark pine/barren

16. Whitebark pine is codominant with subalpine fir and or lodgepole pine. Subalpine fir tends to predominate. Subalpine fir/elk sedge

1. Dominant tree deciduous 17

17. Aspen is the primary tree on the site, but coniferous trees are present and reproducing. Return to No. 2 in the key and follow through as though the site were dominated by the reproducing coniferous tree.

17. Aspen is the primary tree on the site with no coniferous tree present and reproducing.
Aspen/snowberry-elk sedge

Section B. Site dominated by shrubs (or formerly shrub dominated)

18. One of the perennial species, subspecies or forms of sagebrush well represented on the site. See the sagebrush identification key to determine the species, subspecies or form present and then proceed to No. 19 in this key. 19

19. One of the species, or subspecies of low sagebrush well represented on the site. 20

20. Thermopola low sagebrush is the dominant cover. Idaho fescue is the primary associated grass.
Thermopola low sagebrush/Idaho fescue

20. Thermopola low sagebrush is not present on the site. Other species or subspecies of low sagebrush are present. 21

21. Alkali sagebrush (Artemisia longiloba) dominant on the site. Idaho fescue is the primary associated grass.
Alkali sagebrush/Idaho fescue

21. Low sagebrush(Artemisia arbuscula ssp. arbuscula) is dominant on the site. 22

22. Bluebunch wheatgrass is the primary grass associate with the low sagebrush.
Low sagebrush/bluebunch wheatgrass

22. Idaho fescue is the primary grass associate with the low sagebrush.
Low sagebrush/Idaho fescue

19. One of the species, subspecies or forms of big sagebrush well represented on the site. 23

23. Threetip sagebrush is the dominant species of sagebrush present. Other species or subspecies of big or low sagebrush may be present, but the dominant cover is threetip sagebrush. Idaho fescue is the primary grass associate.
Threetip sagebrush/Idaho fescue

23. Threetip sagebrush is not present, or if present other species predominate. 24

24. Mountain silver sagebrush is the dominant species of sagebrush present. Other species or subspecies of big and low sagebrush may be present, but the dominant cover is mountain silver sagebrush. Idaho fescue is the primary grass associate, but sedges and other grasses may codominate.
Mountain silver sagebrush/Idaho fescue

24. Mountain silver sagebrush not present, or if present other species predominate. 25

25. Basin big sagebrush is the dominant species of sagebrush present. Other species or subspecies of big and low sagebrush may be present, but the dominant cover is Basin big sagebrush. In our area annual and biennial grass and forb species are the primary understory associates with cheatgrass the most common.
Basin big sagebrush/cheatgrass

25. Basin big sagebrush not present, or if present other species or subspecies predominate. 26

26. Wyoming big sagebrush is the dominant subspecies present. Other species or subspecies of big and low sagebrush may be present, but the dominant cover is Wyoming big sagebrush. In our area bluebunch wheatgrass is the primary grass associate, with Indian ricegrass and bottlebrush squirreltail also present.
Wyoming big sagebrush/bluebunch wheatgrass

26. Wyoming big sagebrush is not present, or if present, other species or subspecies predominate. 27

27. Mountain big sagebrush is the dominant subspecies of sagebrush present. 28

28. Bluebunch wheatgrass is the dominant grass associate. Bitterbrush may be a common shrub associate. Aspect is usually south to west.
Mountain big sagebrush/bluebunch wheatgrass

28. Bluebunch wheatgrass is not the dominant grass associate. Either Idaho fescue is the dominant grass associate, or the site has abundant shrub associates including chokecherry, serviceberry, snowberry and bitterbrush. 29

29. Idaho fescue is the primary grass associate, scattered plants of bitterbrush and snowberry may be present, but chokecherry and serviceberry are never present. Aspect is various.
Mountain big sagebrush/Idaho fescue

29. Idaho fescue usually is not the primary grass associate. Associated shrubs are abundant, including snowberry, chokecherry, serviceberry, and bitterbrush. Great basin wild rye may be a common grass associate. Aspect usually south to west on steep slopes.
Mountain big sagebrush/mountain brush

27. Subalpine big sagebrush is the dominant form of big sagebrush present. 30

30. Elk sedge is the primary grasslike associate. Snowberry, wax currant and gooseberry currant are shrub associates.
Subalpine big sagebrush-mountain brush/elk sedge

30. Idaho fescue is the primary grass associate. 31

31. Big mountain brome as well as snowberry, and nettleleaf giant hyssop are common associates. Sites are usually found on glacial outwash, moraines, and terraces with coarse gravelly soils.
Subalpine big sagebrush/big mountain brome-Idaho fescue

31. Big mountain brome, nettleleaf giant hyssop and snowberry are usually absent. Singlehead goldenweed is often present. Sites are high elevation slopes and uplands.
Subalpine big sagebrush/Idaho fescue

18. One of the species, subspecies or forms of sagebrush not present on the site, or if present, sagebrush represents a minor component of the total shrub canopy coverage. 32

32. Site formerly dominated by sagebrush as evidenced by burnt or dead stumps. Search of site and area adjacent should reveal what kind of sagebrush should occupy the site. Return to No. 19 and proceed as though the site were dominated by sagebrush. 19

32. Site not formerly dominated by sagebrush. Other species of shrub dominate the site. 33

33. Curlleaf mountain mahogany present and well represented on the site. Bluebunch wheatgrass is the primary understory associate.
Curlleaf mountain mahogany/bluebunch wheatgrass

33. Curlleaf mountain mahogany not present on the site, or if present, represented by a few scattered individuals. Other shrub species are dominant. Bluebunch wheatgrass is not the primary understory associate. 34

34. Singlehead goldenweed is the dominant shrub with Idaho fescue the primary understory associate. This condition is thought to be a seral stage of
Subalpine big sagebrush/Idaho fescue

34. Other species of shrub dominate the site. Idaho fescue is normally not present, or if present, is poorly represented. 35

35. Red mountainheath and Western ledum are the dominant shrubs, but species of willow are also abundant.
Red mountainheath/western ledum

35. Other species of shrub dominant on the site. 36

36. One or more species of willow are dominant. 37

37. Type is subalpine to alpine with several species of willow present. Stands usually average two feet in height, but pockets of taller willow are also present. Species found in the Black alpine sedge/alpine bentgrass and the Red mountain heath/western ledum types are associates in the understory.
Alpine willow

37. Type characteristic of lower elevations. Willows usually average 5 feet or more in height. Usually only one or two species of willow are prominent. Bebb willow is the most common species. Understory species are characteristic of lower elevation meadows. Water sedge is the most common associate.
Willow/water sedge

36. Cassiope is the dominant shrub, but other species may also be present. Sibbaldia is the most common forb associate.
Sibbaldia/Cassiope

Section C. Site dominated by grasses or grasslike plants.

38. Dry upland sites 39

39. Low elevation type confined to steep south to west slopes. Bluebunch wheatgrass is the most abundant species present.
Bluebunch wheatgrass/oniongrass

39. Sites various but not with above combination of characteristics 40

40. Sites subalpine to alpine 41

41. Dominant species is either sheep fescue or Idaho fescue. Site relatively shrub free. Few forbs are associated in the type, primary associates are grasses and grasslikes.
Alpine fescue

41. Site dominated by dryland sedges or rushes. 42

42. Site dominated by Drummond rush.
Alpine dryland-Drummond rush

42.. Site dominated by Tolmie sedge.
Alpine dryland-Tolmie sedge

40. Sites not subalpine to alpine. Various species of grass or grasslike plants dominate the site. Search site and area adjacent to determine the kind of shrub that should occupy the site. Return to No. 18 in key and proceed as though the shrub were present. 18

38. Streamside, lakeside, or meadow sites. 43

43. Sedges or spike rush are the dominant species present. 44

44. Beaked sedge (Carex rostrata) is the dominant species present. Beaked sedge

44. Other species of sedge or spike rush dominant 45

45. Needle spike rush (Eleocharis acicularis) is the dominant species present.
Mid-elevation meadow complex-spike rush

45. Species of sedge are dominant 46

46. Carex miserabilis (sedge) is the dominant species present.
Mid-elevation meadow complex - Carex miserabilis

46. Other species of sedge dominant. 47

47. Carex ablata (sedge) is the dominant species present.
Mid-elevation meadow complex - Carex ablata

47. Black alpine sedge is the dominant species present. Usually alpine bentgrass is also prominent.
Subalpine sites.
Black alpine sedge/alpine bentgrass

43. Grasses are the dominant species present 48

48. Alpine bentgrass is the dominant grass present. Black alpine sedge is a common associate. Subalpine sites.
Black alpine sedge/alpine bentgrass

48. Other species of grasses are dominant. Mid-elevation sites, usually not subalpine. 49

49. Tufted hairgrass is the dominant grass. Annual forbs, biennial forbs, and mat muhly may be prominent.
Tufted hairgrass

49. Mat muhly is the dominant grass, often with Idaho fescue present. Remnant plants of tufted hairgrass may be present. Annual forbs, biennial forbs, and Trifolium spp. are abundant.
Tufted hairgrass

Section D. Site dominated by forbs.

50. Site alpine, very rocky and bouldery. Few plants of any kind present. Most common species include Hulsea, alpine mountain sorrel and Tolmie sedge.
Rocky slope-boulder field

50. Plants more abundant with other species prominent. Subalpine or alpine sites. 51

51. Sandwort (Arenaria aculeata) is dominant often with abundant lupines. Cushion plant-Arenaria

51. Other species dominant. 52

52. Ivesia is dominant or codominant with species of phlox, eriogonum, poa, sedges, and pussytoes.
Cushion plant-Ivesia

52. Sites dominated by forbs without the above characteristics. Seral conditions of a number of types exhibit dominance by various forbs. Determine if one of the species of sagebrush are present on the site or in the near vicinity. If so, return to No. 18. If the site does not have sagebrush present, search for residual perennial grass or grasslike plants and return to No. 38 in the key. 18 or 38

KEY TO THE PERENNIAL SPECIES, SUBSPECIES AND FORMS OF SAGEBRUSH FOUND ON THE SAWTOOTH, WHITE CLOUD, BOULDER AND PIONEER MOUNTAINS

Key No. 2 Key to the perennial species, subspecies and forms of sagebrush found on the Sawtooth, White Cloud, and Boulder Mountains[1/]

1. Plants half shrubs that die back annually to a woody base. 2

   2. Plants mat forming, not spinescent. Leaves numerous, clustered at the base, but well distributed along the stem as well.
      Artemisia frigida (Fringed sagebrush)

   2. Plants much branched from the base, not mat forming, spinescent. Leaves not clustered at the base.
      Artemisia spinescens (Bud sagebrush)

1. Plants true shrubs that do not die back annually to a woody base. 3

   3. Taller shrubs; mature plants 18 or more inches tall 4

      4. Leaves simple and entire, but some leaves may be notched or deeply toothed. Shrub of streamsides, in relatively moist sites.
         Artemisia cana ssp. *viscidula* (Mountain silver sagebrush)

      4. Leaves with three lobes at apex, or may be deeply three lobed. Plants not of streamsides, or if at streamside, the site is well drained and relatively dry. 5

         5. Leaves deeply three lobed, with fine linear lobes. Plant of elevations below 7500 feet in our area.
            Artemisia tripartita (Threetip sagebrush)

         5. Leaves not deeply lobed, or if deeply lobed, not with fine linear lobes. 6

            6. Uneven-topped shrubs with flower stalks arising throughout the crown. (Leaves fluoresce reddish-brown in alcohol when viewed under ultra-violet light). 7

               7. Mature plants more than 30 inches in height. Leaf margins relatively straight, not curved outward. Leaves relatively long-narrow. The ratio of the leaf length to its width is 4.0 plus. Plants tall and stout, often found in dry stream-side sites.
                  Artemisia tridentata ssp. *tridentata* (Basin big sagebrush)

1/ Information in this key was taken from the work of Winward (1970), and Beetle (1960), but modified to fit the local conditions.

7. Mature plants 18 to 30 inches in height (occasionally individual plants are taller). Leaves are short-wide, ratio of leaf length to its width is less than 4.0. Leaf margins curve outward at the lobes. Plants of dry upland sites.
Artemisia tridentata ssp. wyomingensis (Wyoming big sagebrush)

6. Even-topped shrubs with flower stalks arising from upper crown portion and extending above the foliage. (Leaves fluoresce bluish-cream in alcohol when viewed under ultra-violet light). 8

8. Flower heads less than 1.5 mm wide, 4-6 flowers per head. Plants do not layer. Leaves usually not larger than 2 inches long.
Artemisia tridentata ssp. vaseyana (Mountain big sagebrush)

8. Flower heads more than 1.5 mm wide, more than 6 flowers per head. Plants often layer. Leaves may be unusually large, at times larger than 2 inches long.
Artemisia tridentata ssp. vaseyana form spiciformis (Subalpine big sagebrush)

3. Dwarf shrubs, mature plants less than 18 inches tall. 9

9. Leaves small, mostly less than 1 cm long. Leaf color greenish, but may be gray in some plants, leaves are sticky when crushed between the fingers. In our area this species is closely associated with soils derived from limestone.
Artemisia nova (Black sagebrush) 9

9. Leaves larger, mostly greater than 1 cm long. Leaf color grayish. Leaves not sticky or only slightly sticky when crushed between the fingers.

10. Plants early maturing (seeds ripe by the end of August). Inflorescence broad (usually 4 mm or more) and turns brown at maturity.
Artemisia longiloba (Alkali sagebrush)

10. Plants late maturing (seeds do not ripen until October). Inflorescence narrow (usually less than 4mm broad) and may or may not turn brown at maturity. 11

11. Leaves coarse and wedge shaped. In our area the plant rarely occurs above 7700 feet.
Artemisia arbuscula ssp. arbuscula (low sagebrush)

11. Leaves fine and deeply trifid. In our area the plant occurs above 7700 feet, but may occur as low as 6200 feet in the cold valley bottoms in the Wood River and Sawtooth Valleys. Artemisia arbuscula ssp. thermopola (Thermopola low sagebrush)

LITERATURE CITED

LITERATURE CITED

Anonymous 1971
Range Environmental Analysis Handbook - FSH 2209.21 - R-6
U. S. Dept. Agric., For. Serv.

Beetle, A. A. 1960
A study of sagebrush: The section Tridentatae of Artemisia
Univ. Wyom. Agric. Exp. Sta. Bull. No. 368, 83 pp.

_____ and A. Young 1965
A third subspecies of the Artemisia tridentata complex
Rhodora 67:405-406.

Daubenmire R. F. 1952
Forest vegetation of northern Idaho and adjacent Washington and its bearing on concepts of vegetation classification.
Ecol. Mono. 22:301-330.

_____ 1960
An experimental study of variation in the Agropyron spicatum-A. inerme complex. Bot. Gaz. 122:104-108.

_____ 1970
Steppe vegetation of Washington
Wash. Agric. Exp. Sta. Tech. Bull. No. 62, 131 pp.

_____ and J. B. Daubenmire 1968
Forest vegetation of eastern Washington and northern Idaho
Wash. Agric. Exp. Sta. Tech. Bull. No. 60, 104 pp.

Davis, R. J. 1952
Flora of Idaho. Wm. C. Brown Co. Dubuque, Iowa, 828 pp.

Fosberg, M. A. and M. Hironaka 1964
Soil properties affecting the distribution of big and low sagebrush communities in southern Idaho. In: Forage plant physiology and soil-range relationships
Amer. Soc. of Agron. Spec. Publ. No. 5, pp. 230-236.

Hermann, F. J. 1970
Manual of the Carices of the Rocky Mountains and Colorado Basin
Agric. Handbook No. 374, USDA, For. Serv. 397 pp.

Hitchcock, A. S. 1950
Manual of the grasses of the United States
USDA Misc. Publ. No. 200, 1051 pp.

Hitchcock, C. L., A. Cronquist, M. Ownbey and J. W. Thompson 1955
Vascular plants of the Pacific Northwest, Part 5: Compositae
Univ. Wash. Press, Seattle, 343 pp.

_____ 1959
Vascular plants of the Pacific Northwest, Part 4: Ericaceae through Campanulaceae - Univ. Wash. Press, Seattle, 510 pp.

Hitchcock, C. L., A. Cronquist, M. Ownbey and J. W. Thompson 1961
Vascular plants of the Pacific Northwest, Part 3: Saxifragaceae to Ericaceae - Univ. Wash. Press, Seattle, 614 pp.

_____ 1964
Vascular plants of the Pacific Northwest, Part 2: Salicaceae to Saxifragaceae - Univ. Wash. Press, Seattle, 597 pp.

_____ 1969
Vascular plants of the Pacific Northwest, Part 1: Vascular cryptogams, gymnosperms, and monocotyledons - Univ. Wash. Press, Seattle 914 pp.

Holmgren, A. H. and J. L. Reveal 1966
Checklist of the Vascular Plants of the Intermountain Region U.S. For. Serv. Res. Pap. INT 32, 160 pp.

Kelsey, H. P. and W. A. Dayton (ed.) 1942
Standardized plant names - J. H. McFarland Co., Harrisburg, Pa. 675 pp.

Lewis, M. E. and R. Riegelhuth 1964
Sawtooth Mountain Area Study, Idaho: Ecology and vegetation USDA For. Serv. and USDI Park Serv. 25 pp.

Lewis, M. E. 1970
Alpine rangelands of the Uinta Mountains
USDA For. Serv., Region 4, mimeo publ. 75 pp.

_____ 1971
Flora and major plant communities of the Ruby-East Humboldt Mountains with special emphasis on Lamoille Canyon
USDA For. Serv., Region 4, Humboldt Nat. For. mimeo publ. 62 pp.

Lyon, L. J. 1966
Initial vegetal development following prescribed burning of Douglas fir in southcentral Idaho - USDA For. Serv. Res. Pap. INT-29, 17 pp.

_____ 1971
Vegetal development following prescribed burning of Douglas fir in southcentral Idaho. USDA For. Serv. Res. Pap. INT - 105, 30 pp.

Mueggler, W. F. and C. A. Harris 1969
Some vegetation and soil characteristics of mountain grasslands in central Idaho - Ecol. 50(4):671-678.

Reed, R. M. 1969
A study of forest vegetation in the Wind River Mountains, Wyoming Unpubl. Ph.D. thesis, Wash. State Univ., Pullman, Wash. 77 pp.

Roe, A. L. and G. D. Amman 1970
The mountain pine beetle in lodgepole pine forests
USDA For. Serv. Res. Paper INT-71, 23 pp.

Scheldt, R. S. and E. W. Tisdale 1970
Ecology and utilization of curlleaf mountain mahogany in Idaho Univ. of Idaho For. Wildl. and Range Expt. Sta. Note No. 15, 2 pp.

Winward, A. H. 1970
Taxonomic and ecological relationships of the big sagebrush complex in Idaho - Unpubl. Ph.D. thesis, U. of Idaho, 80 pp.

PARTIAL LIST OF PLANTS FOUND ON THE SAWTOOTH, WHITE CLOUDS, BOULDER AND PIONEER MOUNTAINS

Partial List of Plants Found on the
Sawtooth, White Clouds, Boulder and Pioneer Mountains

GRASSES

Agropyron	cristatum (L.) Gaertn.	Crested wheatgrass
"	dasytachyum (Hook.) Scribn.	Thickspike wheatgrass
"	intermedium (Host) Beauv.	Intermediate wheatgrass
* "	spicatum (Pursh) Scribn. & Smith	Bluebunch wheatgrass
"	subsecundum (Link) A. S. Hitchc.	Bearded wheatgrass
"	trachycaulum (Link) Malte	Slender wheatgrass
"	trichophorum (Link) Richt.	Stiffhair wheatgrass
Agrostis	alba L.	Redtop
"	exarata Trin.	Spike bentgrass
"	humilis Vasey	Alpine bentgrass
"	scabra Willd.	
"	scabra Willd. var. scabra (A. hiemalis)	
Bromus	anomalus Rupr.	Nodding brome
"	ciliatus L.	Fringed brome
"	inermis Leyss.	Smooth brome
"	marginatus Nees	Big mountain brome
"	polyanthus Scribn.	
"	tectorum L.	Cheatgrass
Calamagrostis	canadensis (Michx.) Beauv.	Bluejoint reedgrass
"	rubescens Buckl.	Pinegrass
Catabrosa	aquatica (L.) Beauv.	Brookgrass
Dactylis	glomerata L.	Orchardgrass
Danthonia	intermedia Vasey	Timber oatgrass
"	unispicata (Thurb.) Munro	Onespike oatgrass
Deschampsia	atropurpurea (Wahl.) Scheele	Mountain hairgrass
"	caespitosa (L.) Beauv.	Tufted hairgrass
"	danthonioides (Trin.) Munro	Annual hairgrass
"	elongata (Hook.) Munro	Slender hairgrass
Elymus	cinereus Scribn.& Merr.	Great Basin wildrye
"	glaucus Buckl.	Blue wildrye
Festuca	idahoensis Elmer	Idaho fescue
"	ovina L. var. brachyphylla (Schult)Piper	Sheep fescue
Glyceria	borealis (Nash) Batch.	Northern mannagrass
"	grandis S. Wats.	American mannagrass
"	striata (Lam.) A. S. Hitchc.	Fowl mannagrass
Hesperochloa	kingii (S. Wats.) Rydb.	Spike fescue
Hordeum	brachyantherum Nevski	Meadow barley
Koeleria	cristata (L.) Pers.	Junegrass
Melica	bulbosa Geyer	Oniongrass
"	spectabilis Scribn.	Showy oniongrass
Muhlenbergia	richardsonis (Trin.) Rydb.	Mat muhly
Oryzopsis	exigua Thurb.	Little ricegrass
"	hymenoides (Roem & Schult.)	Indian ricegrass
Phleum	alpinum L.	Alpine timothy
"	pratense L.	Timothy

Poa	alpina L.	Alpine bluegrass
"	ampla Merr.	Big bluegrass
"	annua L.	Annual bluegrass
"	canbyi (Scribn.) Poper	Canby bluegrass
"	curta Rydb.	Wasatch bluegrass
"	epilis Scribn.	Skyline bluegrass
"	fendleriana (Steud.) Vasey	Mutton bluegrass
"	glaucifolia Scribn. & Williams	
"	gracillima Vasey	Slender bluegrass
"	leptocoma Trin.	Big bluegrass
"	nervosa (Hook.) Vasey	Wheeler bluegrass
"	nevadensis Vasey	Nevada bluegrass
"	pattersoni Vasey	Patterson bluegrass
"	reflexa Vasey & Scribn.	Nodding bluegrass
"	rupicola Nash	Timberline bluegrass
"	sandbergii Vasey (P. secunda)	Sandberg bluegrass
Sitanion	hystrix (Nutt.) J. G. Smith	Bottlebrush squirreltail
Stipa	columbiana Macoun	Subalpine needlegrass
"	comata Trin. & Rupr.	Needle-and-thread
"	lettermani Vasey	Lettermann needlegrass
"	occidentalis Thurb.	Western needlegrass
"	pinetorum M. E. Jones	Pinewoods needlegrass
"	thurberiana Piper	Thurber needlegrass
Trisetum	spicatum (L.) Richt.	Spike trisetum
"	wolfii Vasey	Wolfs trisetum

*To avoid unnecessary duplication of names, Agropyron spicatum and A. inerme are considered to be one and the same species (Daubenmire, 1960).

Agropyron saxicola was observed on numerous occasions. These plants are sterile hybrids between A. spicatum and Sitanion hystrix (Holmgren & Reveal, 1966). Because its presence has little ecological significance except to indicate the presence of A. spicatum and S. hystrix on a site, it was ignored.

GRASSLIKE PLANTS

Carex	ablata Bailey	
"	angustior Mkze.	
"	aquatilis Wahl.	Water sedge
"	aurea Nutt.	Golden sedge
"	brevipes Boott	
"	canescens L.	
"	concinnoides Mkze.	
"	douglasii Boott	Douglas sedge
"	elynoides Holm	
"	engelmannii L. H. Bailey	
"	epapillosa Mkze.	
"	festivella Mkze.	Ovalhead sedge
"	filifolia Nutt.	Threadhead sedge
"	geyeri Boott	Elk sedge
"	gymnoclada Holm	
"	heteroneura var. epapillosa F. J. Herm.	
"	hoodii Boott	Hood sedge
"	illota L. H. Bailey	Sheep sedge
"	jonesii L. H. Bailey	
"	kelloggii W. Boott	
"	lanuginosa Michx.	Woolly sedge
"	leporinella Mkze.	
"	luzulina var. ablata (Bailey) F. J. Herm.	
"	microptera Mkze.	Smallwing sedge
"	miserabilis Mkze.	
"	multicostata Mkze.	
"	nigricans C. A. Meyer	Black alpine sedge
"	pachystachya Cham.	
"	pelocarpa F. J. Herm.	
"	petasata Dewey	Liddon sedge
"	phaeocephala Piper	Dunhead sedge
"	physocarpa Presl.	
"	praegracilis W. Boott	
"	praticola Rydb.	
"	preslii Steud.	
"	proposita Mkze.	
"	pseudoscirpoidea Rydb.	
"	pyrenaica Wahl.	Pyrenian sedge
"	rossii Boott	Ross sedge
"	rostrata Stokes	Beaked sedge
"	straminiformis L. H. Bailey	
"	subfusca Boott	
"	tolmiei Boott	Tolmie sedge
Eleocharis	spp.	Spikerush
"	acicularis (L.) R. & S.	Needle spikerush
"	macrostachya Britt.	Common spikerush
Juncus	balticus L.	Baltic rush
"	drummondii E. Meyer	Drummond rush
"	longistylis Torr.	
"	mertensianus Bong.	Mertens rush
"	parryi Engelm.	Parry rush
"	regelii Buch.	Regel rush
Luzula	parviflora (Ehrh.) Desv.	Millet woodrush
"	spicata (L.) DC.	Spike woodrush
Scirpus	spp.	Bulrush

FORBS

Achillea	millefolium L. ssp. lanulosa(Nutt.)Piper	Western yarrow
Aconitum	columbianum Nutt.	Columbia monkshood
Actaea	rubra(Ait.)Willd. ssp. arguta(Nutt.)Hult	Red baneberry
Agastache	cusicki (Greenm.) Heller	Hyssop
"	urticifolia (Benth.) Kuntze	Nettleleaf giant hyssop
Agoseris	spp.	Agoseris
"	aurantica (Hook.) Greene	Orange agoseris
"	glauca (Pursh.) Raf.	Pale agoseris
"	" " " var. pumila(Nutt.) Rydb.	
"	grandiflora (Nutt.) Greene	Bigflower agoseris
"	heterophylla (Nutt.) Greene	Annual agoseris
"	retrorsa (Benth.) Greene	
Allium	acuminatum Hook.	Tapertip onion
"	brandegi S. Wats.	Brandegee onion
"	brevistylum S. Wats.	Shortstyle onion
"	fibrillum Jones	Blue mountain onion
"	validum S. Wats.	Pacific onion
"	simillium Hend.	
Alyssum	desertorum Staph.	
Amaranthus	blitoides S. Wats.	
"	retroflexus L.	Redroot amaranthus
Amsinckia	retrorsa Suksd.	Fiddleneck
Anaphalis	margaritaceae (L.) Benth. & Hook.	Common pearleverlasting
Androsace	septentrionalis L.	Rock jasmine
Anemone	globosa Nutt.	Pacific anemone
"	piperi Britt.	Piper anemone
"	occidentalis S. Wats.	Anemone, windflower
Angelica	arguta Nutt.	Sharptooth angelica
Antennaria	spp.	Pussytoes
"	anaphaloides Rydb.	
"	alpina (L.) Gaertn.	Alpine pussytoes
"	corymbosa E. Nels.	
"	lanata (Hook.) Greene	Woolly pussytoes
"	luzuloides T. & G.	Rush pussytoes
"	racemosa Hook.	Raceme pussytoes
"	rosea Greene	Rose pussytoes
"	umbrinella Rydb.	
Anthemis	spp.	Camomile; dogfennel
Apocynum	androsaemifolium L.	Spreading dogbane
Aquilegia	formosa Fisch.	Sitka columbine
Arabis	spp.	Rockcress
"	crucisetosa Const. & Rollins	
"	drummondii A. Gray	Drummond rockcress
"	glabra (L.) Bernh.	Towermustard rockcress
"	holboellii Hornem.	Holboell rockcress
"	microphylla Nutt.	Littleleaf rockcress
Arenaria	spp.	Sandwort
"	aculeata S. Wats.	
"	capillaris Poit	Fescue sandwort
"	congesta Nutt.	Ballhead sandwort
"	macrophylla Hook.	
"	obtusiloba (Rydb.) Fern.	
"	nuttallii Pax.	Nuttall sandwort

Arnica	spp.	Arnica
"	chamissonis Less	Chamisso arnica
"	cordifolia Hook.	Heartleaf arnica
"	latifolia Bong.	Broadleaf arnica
"	longifolia D. C. Eaton	Longleaf arnica
"	mollis Hook.	Hairy arnica
"	rydbergii Greene	
"	sororia Greene	
Artemisia	biennis Willd.	Biennial wormwood
"	dracunculus L.	Tarragon
"	ludoviciana Nutt.	Louisiana sagebrush
Aster	spp.	Michaelmasdaisy
"	alpigenus (Torr. & Gray)	
"	chilensis Nees	Pacific aster
"	conspicuus Lindl.	
"	integrifolius Nutt.	Thickstem aster
"	leiodes Blake	
"	perelegans A. Nels. & Macbr.	Nuttall aster
"	scopulorum A. Gray	Crag aster
"	sibiricus L.	Siberian aster
"	stenomeres Gray	
Astragalus	spp.	Locoweed, milkvetch
"	alpinus L.	Alpine milkvetch
"	convallarius Greene	Timber poisonvetch
"	kentrophyta A. Gray	
"	oniciformis Barneby	
"	tegetarius Wats.	Mat milkvetch
"	vexilliflexus Sheld.	
"	whitneyi Gran	
Athyrium	alpestre (Hoppe) Rylands var. americanum Butters	Western ladyfern
Balsamorhiza	sagittata (Pursh) Nutt.	Arrowleaf balsamroot
Berteroa	incana (L.) DC.	Hoary alyssum
Besseya	rubra (Dougl.) Rydb.	Red kittentails
Brickellia	spp.	Brickella
"	microphylla (Nutt.) A. Gray	Littleleaf brickellia
Calochortus	apiculatus Baker	
"	eurycarpus S. Wats.	Sego lily, mariposa
"	nitidus Dougl.	Broadfruit mariposa
Caltha	leptosepala DC.	Elkslip marshmarigold
Capsella	bursa-pastoris (L.) Medic.	Shepherds-purse
Cardamine	cordifolia A. Gray	Heartleaf bittercress
Castilleja	spp.	Indian paintbrush
"	angustifolia (Nutt.) G. Don	Northwestern painted-cup
"	apiculatus Baker	
"	applegatei Fern.	
"	chromosa A. Nels.	
"	cusickii Greenm.	Yellow paintbrush
"	gracillima Rydb.	
"	linariaefolia Benth.	Wyoming painted-cup
"	longispica A. Nels.	
"	miniata Dougl.	Scarlet painted-cup
"	rhexifolia Rydb.	Splitleaf painted-cup
"	rustica Piper	
Chaenactis	alpina (A. Gray) M. E. Jones	
"	douglasii (Hook.) Hook. & Arn	Douglas chaenactis

Chenopodium	spp.	Pigweed
"	album L.	Lambsquarter goosefoot
Chionophila	tweedyi (C. & R.) Hends.	Snowlover
Chimaphila	umbellata (L.) Barton	Western pipissewa
Cirsium	spp.	Thistle
"	arvense (L.) Scop.	Canada thistle
"	foliosum (Hook.) DC.	Elk thistle
"	vulgare (Savi) Tenore	Bull thistle
Claytonia	chamissoi Ledeb.	Water springbeauty
"	lanceolata Pursh	Lanceleaf springbeauty
Clematis	columbiana (Nutt.) Torr. & Gray	Virgin's bower
Collinsia	grandiflora Dougl. (tenella)	Bluelips collinsia
"	parviflora Dougl.	Littleflower collinsia
Collomia	debilis (S. Wats.) Greene	Collomia
"	linearis Nutt.	Slenderleaf collomia
Conyza	canadensis (L.) Cronq.	Horseweed
Cordylanthus	ramosus Nutt.	Bush birdbeak
Corydalis	aurea Willd.	Goldencorydalis
"	caseana Gray	Fitweed corydalis
Crepis	acuminata Nutt.	Tapertip hawksbeard
"	occidentalis Nutt.	Western hawksbeard
Cryptantha	spp.	Cryptantha
"	affinis (Gray) Greene	
"	interrupta (Greene) Payson	
"	torreyana (A. Gray) Greene	
Cymopterus	acaulis (Pursh) Raf.	
"	bipinnatus S. Wats.	
Cystopteris	fragilis (L.) Bernh.	Brittle bladderfern
Delphinium	barbeyi (Huth) Huth	Barbey larkspur
"	bicolor Nutt.	Little larkspur
"	depauperatum Nutt.	Slim larkspur
"	glaucescens Rydb.	
"	nelsoni Greene	Menzies larkspur
Descurainia	richardsonii (Sweet) O. E. Schultz	Richardson tansymustard
"	sophia (L.) Webb.	Flixweed tansymustard
Dicentra	uniflora Kell.	Steershead bleedingheart
Dodecatheon	jeffryi Van Houtte	Jeffry shootingstar
"	pulchellum (Raf.) Merrill (=pauciflorum)	
Draba	spp.	
"	apiculata C. L. Hitchc.	Draba
"	crassifolia R. Grah.	
"	cunnefolia Nutt.	
"	densifolia Nutt.	Rockcress draba
"	oligosperma Hook.	Draba
"	paysonii Macbr.	Payson draba
"	reptans (Lam.) Fern.	
Enceliopsis	nudicaulis (Gray) A. Nels.	Barestem enceliopsis
Epilobium	spp.	Willowweed
"	adenocaulon Hausskn. (= watsonii)	Sticky willowweed
"	alpinum L.	Alpine willowweed
"	angustifolium L.	Fireweed
"	glaberrimum Barbey	
"	obcordatum A. Gray	
"	paniculatum Nutt.	Autumn willowweed

Equisetum	arvense L.	Field horsetail
Erigeron	spp.	Fleabane daisy
"	acris L.	Bitter fleabane
"	asperugineus (D. C. Eaton) Gray	
"	bloomeri Gray	Bloomer fleabane
"	compositus Pursh	Fernleaf fleabane
"	coulteri Porter	Coulter fleabane
"	divergens T. & G.	Spreading fleabane
"	evermannii Rydb.	Everman fleabane
"	humilis Graham	
"	leiomerus A. Gray	
"	linearis (Hook.) Piper	
"	lonchophyllus Hook.	Spearleaf fleabane
"	ovinus Cronq.	
"	peregrinus (Pursh) Greene	
"	pumilis Nutt.	Low fleabane
"	simplex Greene	
"	speciosus (Lindl.)	Oregon fleabane
"	subtrinervis Rydb.	Threenerve fleabane
"	tweedyi Canby	
"	ursinus D. C. Eaton	Bear River fleabane
Eriogonum	spp.	Eriogonum
"	acaule Nutt. (= caespitosum)	
"	chrysocephalum A. Gray	Goldball eriogonum
"	chrysops Rydb.	
"	flavum Nutt.	Yellow eriogonum
"	heracleoides Nutt.	Wyeth eriogonum
"	ovalifolium Nutt. var. depressum Blank.	Cushion eriogonum
"	ovalifolium Nutt. var. nivale (Canby) M. E. Jones	
"	pyrolaefolium Hook.	
"	umbellatum Torr.	Sulfur eriogonum
Eriophyllum	lanatum Pursh	Woolly eriogonum
Erytrichium	nanum (Vill.) Schrad. var. elongatum (Rydb.) Cronq.	Alpine forget-me-not
Erysimum	spp.	Erysimum
"	capitatum (Dougl.) Greene	Coastal wallflower
Fragaria	spp.	Strawberry
"	virginiana Duchm.	
Frasera	montana Mulford	Small frasera
"	speciosa Dougl.	Showy frasera
Fritillaria	atropurpurea Nutt.	Purplespot fritillaria
Galium	spp.	Bedstraw
"	boreale L.	Northern bedstraw
"	triflorum Michx.	Sweetscented bedstraw
Gayophytum	nuttallii Torr. & Gray	Groundsmoke
"	ramosissimum Torr. & Gray	Groundsmoke
Gentiana	spp.	Gentian
"	calycosa Griseb.	Rainier pleated gentian
"	simplex Gray	
Geranium	richardsonii Fisch. and Trautv.	Richardson geranium
"	viscosissimum Fisch. & C. A. Meyer	Sticky geranium

Geum	macrophyllum Willd.	Largeleaf avens
"	rossii (R. Br.) Ser. var. turbinatum (Rydb.) C. L. Hitchc.	
"	triflorum Pursh	
Gilia	spp.	Gilia
"	aggregata (Pursh) Spreng.	Skyrocket gilia
"	congesta Hook.	Ballhead gilia
Goodyear	oblongifolia Raf.	Westernrattlesnake planta
Grindelia	squarrosa (Pursh) Dunal	Curlycup gumweed
Habenaria	dilatata (Pursh) Hook.	White bog orchid
Hackelia	cinera (Piper) Jtn.	
"	floribunda (Lehm.) I. M. Johnst.	Showy stickseed
"	patens (Nutt.) I. M. Johnst.	
Haplopappus	spp.	Goldenweed
"	acaulis (Nutt.) A. Gray	Stemless goldenweed
"	carthamoides (Hook.) Gray	
"	lanuginosus Gray	
"	lyallii A. Gray	
"	pygmaeus (T. & G.) A. Gray	
Helianthella	uniflora (Nutt.) T. & G.	Oneflower helianthella
Helianthus	annuus L.	Common sunflower
Heracleum	lanatum Michx.	Common cowparsnip
Hesperochiron	pumilus Griseb. Porter	
Heuchera	spp.	Alumroot
"	cylindrica Dougl.	Roundleaf alumroot
"	parvifolia Nutt.	Littleleaf alumroot
Hieracium	albertinum Farr	Hawkweed
"	cynoglossoides Arv.-Touv.	Houndstongue hawkweed
"	gracile Hook.	Slender hawkweed
Hulsea	algida A. Gray	
Hydrophyllum	capitatum Dougl.	Bullhead waterleaf
Hymenopappus	spp.	Hymenopappus
Hymenoxys	grandiflora (Torr. & Gray) Parker	Graylocks hymenoxys
Hyoscyamus	niger L.	Black henbane
Illiamna	rivularis (Dougl.) Greene	Stream illiamna
Iris	missouriensis Nutt.	Rocky Mountain iris
Ivesia	gordonii (Hook.) Torr. & Gray	Gordon ivesia
Kelloggia	galioides Torr.	
Lactuca	serriola L.	Prickly lettuce
Lappula	echinata Gilib.	European stickseed
"	redowskii (Hornem.) Greene	Annual stickseed
Lepidium	virginicum L.	Virginia pepperweed
Lesquerella	alpina (Nutt.) S. Wats.	Bladderpod
Lewisia	pygmaea (A. Gray) Robins	Least lewisia
Ligusticum	filicinum S. Wats. var. filicinum	Fernleaf ligusticum
"	" " " var. tenuifolium (S. Wats.) Mathias & Constance	Fernleaf ligusticum
Linanthastrum	nattallii (A. Gray) Ewan	
Linanthus	spp.	
"	harknessii (Curran) Greene	
"	septentrionalis Mason	
Linaria	vulgaris Hill	Butter-and-eggs toadflax

linnaea	borealis L.	Longtube twinflower
Linum	lewisii Pursh	Lewis flax
Lithophragma	tenella Nutt.	Slender woodland star
Lithospermum	ruderale Dougl.	Wayside gromwell
Lomatium	dissectum (Nutt.) Mathias & Constance	Carrotleaf leptotaenia
"	idahoensis Mathias & Constance	
Lupinus	spp.	Lupine
"	argenteus Pursh	Silvery lupine
"	caudatus Kell.	Tailcup lupine
"	holosericeus Nutt.	
"	laxiflorus Dougl.	
"	lepidus Dougl.	Pacific lupine
"	leucophyllus Dougl.	Velvet lupine
"	sericeus Pursh	Silky lupine
Machaeranthera	canescens (Pursh) Gray (=A. canescens)	Hoary aster
Madia	glomerata Hook.	Cluster tarweed
"	gracilis (Smith) Hook. (Phlox gracilis)	
Matricaria	matricarioides (Less.) Porter	Pineappleweed
"	maritima L.	Dog fennel
Mentha	spicata L.	Spearmint
Mentzelia	spp.	Blazing star
"	albicaulus Dougl.	Whitestem blazing star
Mertensia	ciliata (James) G. Don.	Mountain bluebells
"	oblongifolia (Nutt.) G. Don	Oblongleaf bluebells
Microseris	spp.	Microseris
"	nutans (Geyer) Schultz-Bip.	Nodding microseris
Microsteris	gracilis (Hook.) Green (=Phlox gracilis)	
Mimulus	breviflorus Piper	
"	guttatus DC.	Common monkeyflower
"	lewisii Pursh	Lewis monkeyflower
"	primuloides Benth.	Primrose monkeyflower
Mitella	pentandra Hook.	Fivestamen miterwort
Moldavica	parviflora (Nutt.) Britton	American dragonhead
Myosotis	sylvatica D.C.	
Nemophylla	breviflora Gray	Great Basin baby-blue-eyes
Oenothera	heterantha Nutt.	
Orogenia	linearifolia S. Wats.	Indian potato
Orthocarpus	luteus Nutt.	Yellow owlclover
Osmorhiza	chilensis Hook. & Arn	
"	depauperata Phill. (= O. obtusa)	
"	occidentalis (Nutt.) Torr.	Sweet anise
Oxyria	digyna (L.) Hill	Alpine mountain sorrel
Oxytropis	campestris (L.) DC.	Plains crazyweed
"	sericea Nutt.	Silky crazyweed
Parnassia	fimbriata Lonig	Rocky Mt. parnassia
Paronychia	sessiliflora Nutt.	Creeping nailwort
Pedicularis	spp.	Lousewort
"	contorta Benth.	Coiled lousewort
"	groenlandica Retz.	Elephanthead lousewort
"	racemosa Dougl.	Sickletop pedicularis

Penstemon	spp.	Beardtongue, penstemon
"	attenuatus Dougl.	Sulfur penstemon
"	cusickii A. Gray	Cusick penstemon
"	deustus Dougl.	Scabland penstemon
"	ellipticus Coult. & Fisher	Rockvine penstemon
"	eriantherus Pursh	Fuzzytongue penstemon
"	fruticosus (Pursh) Greene	Desert Mt. penstemon
"	globosus (Piper) Pennell & Keck.	
"	gracilis Nutt.	
"	humilis Nutt.	Low penstemon
"	laxus A. Nels.	Idaho penstemon
"	montanus Greene	Cordroot penstemon
"	procerus Dougl.	Littleflower penstemon
"	pumilus Nutt.	
Petrophytum	caespitosum (Nutt.) Rydb.	Tufted rockmat
Phacelia	hastata Dougl. var. hastata	
"	" " var. compact (Brand) Cronq.	Scorpion weed
Phlox	aculeata A. Nels.	Idaho phlox
"	albomarginata Jones	
"	alyssifolia Greene	
"	hoodii Rich	Hoods phlox
"	longifolia Nutt.	Longleaf phlox
"	pulvinata (Wherry) Cronq.	
Physaria	geyeri (Hook.) Gray	
Plantago	major L.	Rippleseed plantain
Polemonium	pulcherrimum Hook.	Skunkleaf polemonium
"	viscosum Nutt.	Sticky polemonium
Polygonum	aviculare L.	Prostrate knotweed
"	bistortoides Pursh	American bistort
"	douglasii Greene	Douglas knotweed
"	phytolaccaefolium Meisn.	Pokeweed fleeceflower
"	viviparum L.	Viviparous knotweed
Potentilla	spp.	Cinquefoil
"	diversifolia Lehm.	Varileaf cinquefoil
"	glandulosa Lindl.	Gland cinquefoil
"	gracilis Dougl.	Northwest cinquefoil
"	ovina Macoun	
"	quinquefolia (Rydb.) Rydb.	
Primula	cusickiana Gray	Primrose
Pyrola	asarifolia Michx.	Alpine pyrola
"	dentata Smith	
"	elliptica Nutt.	Waxflower pyrola
"	minor L.	Snowline pyrola
"	secunda L.	Sidebells pyrola
"	virens Schweigg	Green pyrola
"	uniflora L.	Single beauty pyrola
Ranunculus	spp.	Buttercup, crowfoot
"	acriformis A. Gray	
"	adoneus A. Gray	
"	alismaefolius Geyer ex. Benth.	Dwarf plainleaf buttercup
"	eschscholtzii adoneus (Gray)C.L.Hitchc.	Eschscholtz buttercup
"	pedatifidus J. E. Smith	

Rumex	spp.	Dock, sorrel
"	crispus L.	Curly dock
"	mexicanus Meisn.	Mexican dock
"	paucifolius Nutt.	Mountain sorrel
Salsola	kali L. var. tenuiflora Tausch.	Russian thistle
Saxifraga	integrifolia Hook.	Columbian saxifrage
"	marshallii Greene var. idahoensis (Piper) Engl. & Irmsch.	
"	occidentalis S. Wats.	Alberta saxifrage
"	oppositifolia L.	Twinleaf saxifrage
"	oregana var. montanis (Small) C.L.Hitchc.	
"	punctata L.	
"	rhomboidea Greene	Diamondleaf saxifrage
Scrophularia	lanceolata Pursh	Lanceleaf figwort
Scutellaria	antirrhinoides Benth.	
Sedum	stenopetalum Pursh	Wormleaf stonecrop
Selaginella	spp.	Spikemoss
"	densa Rydb.	
"	watsoni Underw.	
Senecio	canus Hook.	Woolly groundsel
"	crassulus A. Gray	Thickleaf groundsel
"	cymbalarioides Buek	Cleftleaf groundsel
"	debilis Nutt.	
"	fremontii Torr. & Gray	
"	integerrimus Nutt.	Lambstongue groundsel
"	lugens Rich.	
"	serra Hook.	Butterweed groundsel
"	subnudus DC.	
"	triangularis Hook.	Arrowleaf groundsel
"	werneriaefolius Gray	
Sibbaldia	procumbens L.	
Silene	spp.	Silene
Sisymbrium	altissimum L.	Tumblemustard
Sisyrinchium	sarmentosum Suksd.	
Smelowskia	calycina C. A. Meyer	
Smilacina	racemosa (L.) Desf.	Fat Solomon plume
"	stellata (L.) Desf.	Starry Solomon plume
Solidago	canadensis L.	Canada goldenrod
"	multiradiata Ait.	Low goldenrod
Spergularia	rubra (L.) J. & C. Presl	Red sandspurry
Spenosciadium	capitellatum A. Gray	Range woollyhead parsnip
Stellaria	spp.	Starwort
"	jamesiana Torr.	Tuber starwort
"	longifolia Muhl.	
Stephanomeria	tenuifolia (Torr.) Hall	
Streptopus	amplexifolius L. DC.	Claspedleaf twistedstalk
Swertia	perennis L.	Alpinebog swertia
Taraxacum	officinale Weber	Common dandelion
Thalictrum	fendleri Engelm.	Fendler meadowrue
"	occidentale A. Gray	Western meadowrue
Thlaspi	arvense L.	Field pennycress
"	fendleri Gray (=T. glaucum-T. alpestre)	Blue pennycress
Tofieldia	glutinosa (Michx.) Pers.	Tofieldia

Townsendia	montana M. E. Jones	
Tragopogon	spp.	Goatsbeard, salsify
"	dubius Scop.	Salsify
Trifolium	eriocephalum Nutt.	Woollyhead clover
"	gymnocarpon Nutt.	Hollyleaf clover
"	longipes Nutt.	Longstalk clover
"	pratense L.	Red clover
Typha	spp.	Cattail
Urtica	dioica L.	Big stinging nettle
Valeriana	spp.	Valerian
"	acutiloba Rydb.	Sharpleaf valerian
"	edulis Nutt.	Edible valerian
"	occidentalis Heller	Western valerian
"	sitchensis Bong.	
Veratrum	californicum Dur.	Calif. false-hellebore
Verbascum	thapsus L.	Flannel mullein
Veronica	spp.	Speedwell
"	americana Schw.	American speedwell
"	cusickii Gray	Cusick speedwell
"	wormskjoldii Roem. & Schult.	Wormskjold speedwell
Viola	spp.	Violet
"	adunca J. E. Smith	Hook violet
"	nuttallii Pursh.	Nuttall violet
" "	praemorsa Dougl.	
"	purpurea Kellogg	Goosefoot violet
"	valicola A. Nels.	
Woodsia	oregana D. C. Eaton	Oregon woodsia
Wyethia	helianthoides Nutt.	Whitehead wyethia
Zigadenus	elegans Pursh	Mountain deathcamas
"	paniculatus S. Wats.	Foothill deathcamas

TREES AND SHRUBS

Abies	lasiocarpa (Hook.) Nutt.	Subalpine fir
Acer	glabrum Torr.	Rocky Mountain maple
Alnus	sinuata (Regel) Rydb.	Mountain alder
"	incana (L.) Moench. (=A. tenuifolia)	Thinleaf alder
Amelanchier	alnifolia (Nutt.) Nutt.	Saskatoon serviceberry
Arctostaphylos	uva-ursi (L.) Spreng.	Bearberry
Artemisia	arbuscula Nutt. ssp. arbuscula	Low sagebrush
"	arbuscula Nutt. ssp. thermopola Beetle	Thermopola sagebrush
"	cana Pursh ssp.viscidula(Osterhout) Beetle	Mountain silver sagebrush
"	frigida Willd.	Fringed sagebrush
"	longiloba (Osterhout) Beetle	Alkali sagebrush
"	nova Nelson	Black sagebrush
"	spinescens D. C. Eaton	Bud sagebrush
"	tridentata Nutt. ssp. tridentata	Big sagebrush
"	tridentata Nutt. ssp. vaseyana Rydb. Beetle	Mountain big sagebrush
"	tridentata Nutt. ssp. vaseyana Rydb. Beetle form spiciformis (Osterhout) Beetle	Subalpine sagebrush
"	tridentata Nutt. ssp. wyomingensis Beetle	Wyoming sagebrush
"	tripartita Rydb.	Threetip sagebrush
Atriplex	confertifolia (Torr. & Frem.) S. Wats.	Shadscale
Berberis	repens Lindl.	Creeping barberry
Betula	glandulosa Michx.	Bog birch
Cassiope	mertensiana (Bong.) G. Don	Mertens cassiope
Ceanothus	velutinus Dougl.	Snowbrush ceanothus
Cercocarpus	ledifolius Nutt.	Curlleaf mountain mahogany
Chamaebatiaria	millefolium (Torr.) Maxim.	Desertsweet
Chrysothamnus	nauseosus (Pall.) Britton	Rubber rabbitbrush
"	viscidiflorus (Hook.) Nutt.	Douglas rabbitbrush
Eriogonum	microthecum Nutt.	Slenderbush eriogonum
Eurotia	lanata (Pursh) Moq.	Common winterfat
Gaultheria	humifusa (Grah.) Rydb.	Western wintergreen
Glossopetalon	nevadense A. Gray	Nevada greasebush
Grayia	spinosa Hook. & Arn.	Spiny hopsage
Haplopappus	macronema A. Gray	Whitestem goldenweed
"	suffruticosus (Nutt.) A. Gray	Singlehead goldenweed
Holodiscus	discolor (Pursh) Maxim.	Rockspirea (Creambush)
"	dumosus (Hook.) Heller var. glabrescens (Greenm.) Jeps.	Ocean-spray
Juniperus	communis L. var. saxatilis Pall. (=J. communis var. montana)	
"	occidentalis Hook.	Sierra juniper
Kalmia	polifolia Wang.	Mt. laurel, kalmia
Ledum	glandulosum Nutt.	Western ledum
Leptodactylon	pungens (Torr.) Nutt.	Prickly phlox
Lonicera	spp.	Honeysuckle
"	involucrata (Tich.) Banks	Bearberry honeysuckle
"	utahensis S. Wats.	Utah honeysuckle
Opuntia	spp.	Pricklypear, cholla
Phylodoce	empetriformis (Sw.) D. Don	Red mountainheath
Picea	engelmannii Parry	Engelmann spruce

Pinus	albicaulis Engelm.	Whitebark pine
"	contorta Dougl.	Lodgepole pine
"	flexilis James	Limber pine
"	ponderosa Laws.	Ponderosa pine
Populus	tremuloides Michx.	Quaking aspen
"	trichocarpa T. &. G.	Black cottonwood
Potentilla	fruticosa L.	Bush cinquefoil
Prunus	emarginata (Dougl.) Walpers	
"	virginiana L.	Common chokecherry
Pseudotsuga	menziesii (Mirb.) Franco	Douglas fir
Purshia	tridentata (Pursh) DC.	Antelope bitterbrush
Ribes	cereum Dougl.	Wax currant
"	lacustre (Pers.) Poir.	Prickly currant
"	montigenum McClatchie	Gooseberry currant
"	petiolare Dougl.	Western black currant
"	visosissimum Pursh	Sticky currant
Rosa	spp.	Rose
"	gymnocarpa Nutt.	Baldhip rose
"	nutkana Presl.	Bristly nootka rose
"	woodsii Lindl.	Woods rose
Rubus	idaeus L.	American red raspberry
"	parviflorus Nutt.	Western thimbleberry
Salix	spp.	Willow
"	anglorum chamisso var. antiplasta Schneider.	
"	arctica Pall.	Arctic willow
"	bebbiana Sarg.	Bebb willow
"	brachycarpa Nutt.	Bareground willow
"	candida Fluegge	Hoary, sage-leaf willow
"	geyeriana Anderss.	Geyer willow
"	mackensiana (Hook.)	
"	nivalis Hook.	Snow willow
"	pedicellaris Pursh	
"	scouleriana Barratt	Scouler willow
"	tweedyi Bebb	Tweedy's willow
"	wolfii Bebb	Wolf's willow
Sambucus	caerula Raf.	Blueberry elder
"	racemosa L.	
Shepherdia	canadensis (L.) Nutt.	Russet buffaloberry
Sorbus	scopulina Greene	Greene's mountainash
Spirea	betulifolia Pall.	White spiraea
"	densiflora Nutt.	
"	douglasii Hook.	
Symphoricarpos	oreophilus A. Gray	Mountain snowberry
Tetradymia	canescens DC.	Gray horsebrush
Vaccinium	caespitosum Michx.	Dwarf blueberry
"	globulare Rydb.	
"	membranaceum Dougl.	
"	scoparium Leib.	Grouse whortleberry
"	occidentalis A. Gray	Western bog blueberry

Property of
National FS Library
USDA Forest Service
240 W Prospect Rd
Fort Collins CO 80526